

# AI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT**

**MAY 15, 1958**

***In This Issue***

Improvements in Buick's Engine Plant Equipment  
Preview of the Indianapolis 500-Mile Race  
Still More Zinc Die Castings in 1958 Cars  
Turning Transmission Parts on Tracer Lathes  
Bright, Crack-Free Chromium Plating at Cadillac  
New Method for Producing Gas Turbine Wheels

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**A C H I L T O N P U B L I C A T I O N**

# it's mainly a matter of **TIMING!**

**The net cost of replacing a machine depends on WHEN you do it**

**T**HERE'S A TIME to buy and a time to sell. A time to invest and a time to "sit tight." And a time when you *should* replace an old machine with a new one.

Actually, timing is the most important factor in any replacement program. For there is one precisely predictable time when the replacement of any machine will work out to your best advantage—productionwise and investmentwise. Too soon is just as bad as too late. Either way you *lose money!*

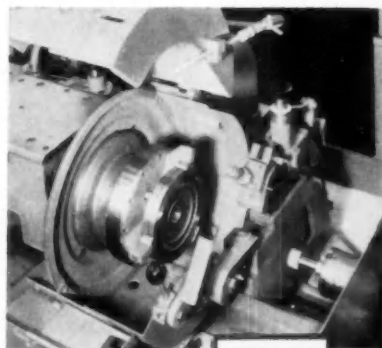
Unless you can afford a loss—and it could be substantial—don't trust intuition or rule-of-thumb computations to determine when a machine should be replaced.

There are many variables involved, but they can all be expressed in dollars and cents. And correct timing then becomes a matter of simple arithmetic.

Our sales engineers are well experienced in making obsolescence studies and determining the proper replacement timing. If you'd like some expert assistance in planning your replacement program—or want to confirm your own calculations on a particular machine, just call in your Heald engineer. He will be glad to make a replacement analysis, without obligation of course. Similar studies by Heald engineers have pointed the way to many important savings.

**For Example:** A large machinery manufacturer was using an old Model 72A Heald Internal to grind the bore and adjacent face of steel countershaft gears. A cost analysis revealed that by replacing this with a new Model 271 Size-Matic, substantial savings could be made. The new machine, shown at the right, was installed with the following results.

	ANNUAL COSTS	
	Old Machine	New Machine
Direct Labor	\$13,299.00	\$ 5,079.00
Power Consumption	427.00	182.00
Property Taxes & Insurance	45.00	552.00
Normal Maintenance	841.00	500.00
Restorative Repairs, Old Mach.	4,066.00	....
Capital Investment, New Mach.	....	6,256.00
Total Cost Per Year	\$18,678.00	\$12,569.00
Annual Saving, New Machine.....		\$ 6,109.00



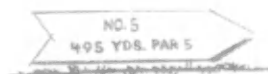
**YOU pay for obsolescence. Replacement pays for itself!**

## **THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

**Worcester 6, Massachusetts**

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



# For your specialized adhesive problems, call on *Ray-BOND*® adhesive specialists

## FOR THESE AND 1001 OTHER APPLICATIONS, NEW R/M RAY-BOND ADHESIVES CAN BE TAILORED TO YOUR NEEDS

Many of your fabrication and assembly problems can be solved quickly and economically with the wide range of Ray-BOND thermosetting and thermoplastic adhesives manufactured by Raybestos-Manhattan. For special requirements, R/M will tailor special adhesives . . . designed to meet your own particular manufacturing techniques, the demands of the materials you are using, and the service conditions of the product itself.

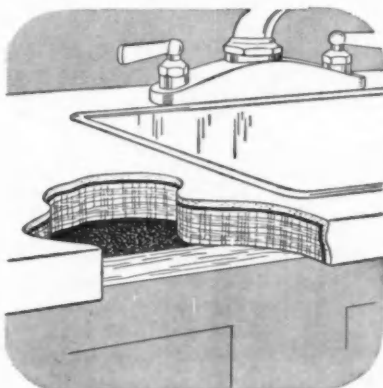
Whichever you use, you can be sure that

Ray-BOND will help you cut expenses, speed production, and simplify your operations. You can assemble complex shapes, bond parts of dissimilar materials, and do away with rivets and other fasteners. Your products will be able to withstand extremes of heat and cold and will have greater conductivity.

If bonding, laminating, sealing or coating can cut costs or improve production in your own operations, call on Raybestos-Manhattan engineers today.



R/M Bulletin No. 700 contains engineering information you will want on Ray-BOND adhesives, protective coatings and sealers. Write for your free copy.



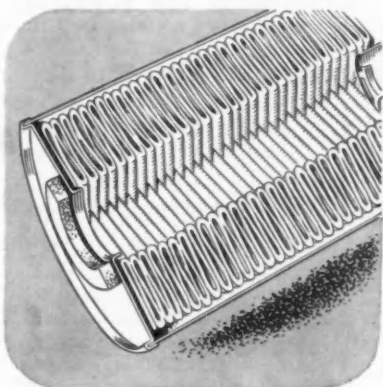
Bonding cabinet top to base.



To create a firm bond on polyethylene plastic sewer and irrigation pipe.



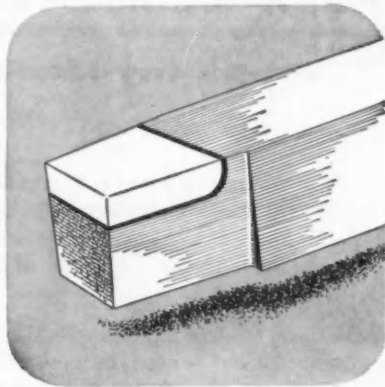
Bonding friction materials to metal.



Bonding paper to cork, aluminum or other metals for use in oil filter.



Bonding laminated panels of new plastic refrigerator.



Bonding ceramic tip to metal tool bit.



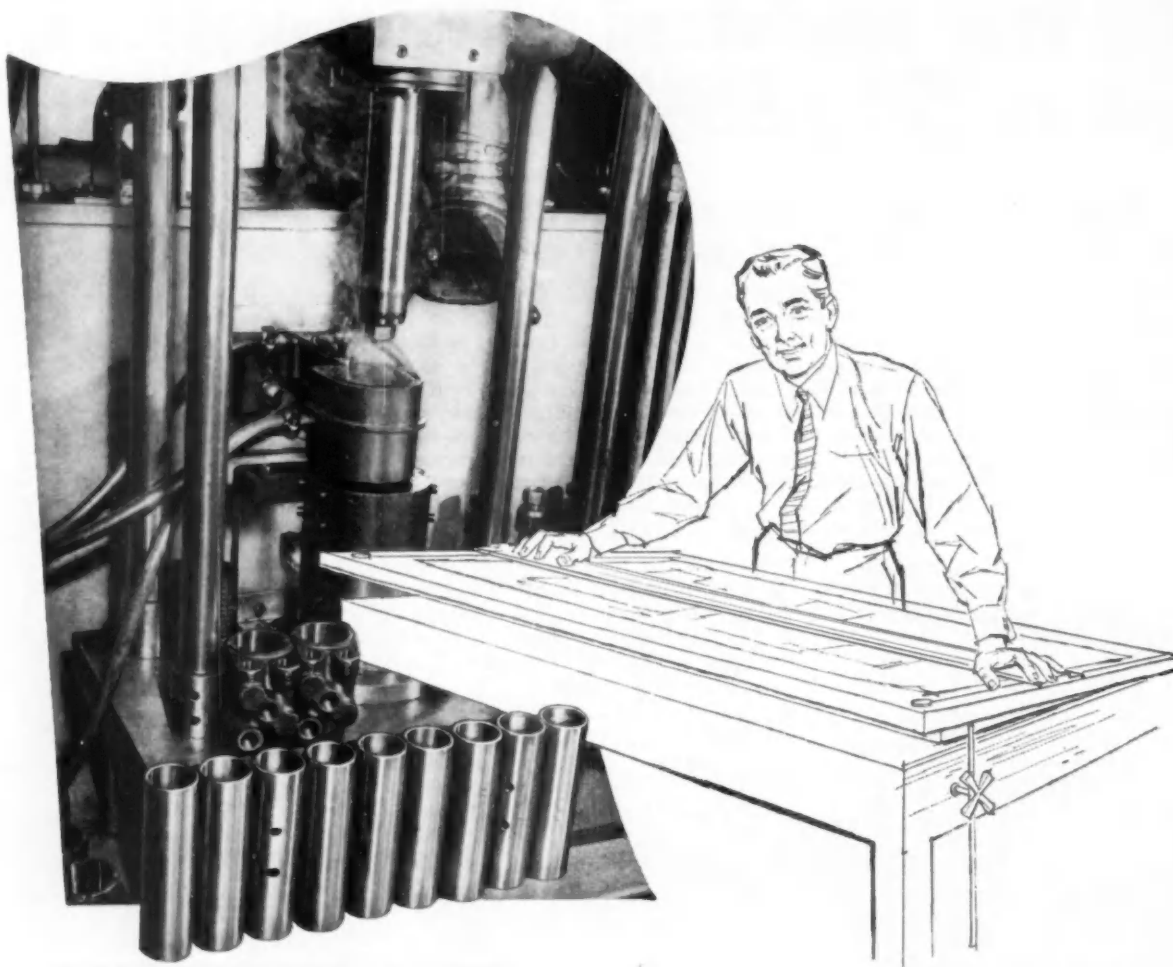
## RAYBESTOS-MANHATTAN, INC.

ADHESIVES DEPARTMENT: Bridgeport, Conn.

Chicago 31 • Detroit 2 • Cleveland 16 • Los Angeles 58

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; Passaic, N.J.; No. Charleston, S.C.; Crawfordsville, Ind.; Neenah, Wis.; Paramount, Calif.  
Raybestos-Manhattan (Canada) Limited, Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Industrial Adhesives • Brake Linings • Brake Blocks • Clutch Facings • Industrial Rubber • Engineered Plastics • Sintered Metal Products  
Rubber Covered Equipment • Asbestos Textiles • Laundry Pads and Covers • Packings • Abrasive and Diamond Wheels • Bowling Balls



**"B&W Welded Tubing with special smooth ID finish keeps my fabrication problems to a minimum!"**

As a design engineer for hydraulic applications, I find that B&W Welded Carbon Steel

Mechanical Tubing with special smooth ID finish offers outstanding benefits.

The finished condition in which it comes to our plant reduces costs by eliminating a number of fabricating operations."

The uniform finish of this type of tubing means that for many hydraulic applications it can be used "as received" from the mill—eliminating such operations as grinding and polishing. Continuous quality control through every manufacturing operation—with ultrasonic testing supplementing accepted methods of inspection—makes sure that you get tubes matched to your end-use application.

Ask Mr. Tubes, the B&W specialist—he can help you with any tube problem—or write for bulletin TB-428. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



TA-8009-M2

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals.

# AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

MAY 15, 1958

VOL. 118, NO. 10

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MEMBER



National Business  
Publications, Inc.



Audit Bureau  
of Circulations

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AUTOMOTIVE INDUSTRIES, May 15, 1958



# **HYATT** TAPERED ROLLER BEARINGS ARE BEING BUILT INTO NEW AUTOMOBILES BY THE MILLIONS!

*Nearly half of all  
American cars and  
trucks built today  
have HYATT Tapered  
Roller Bearings*

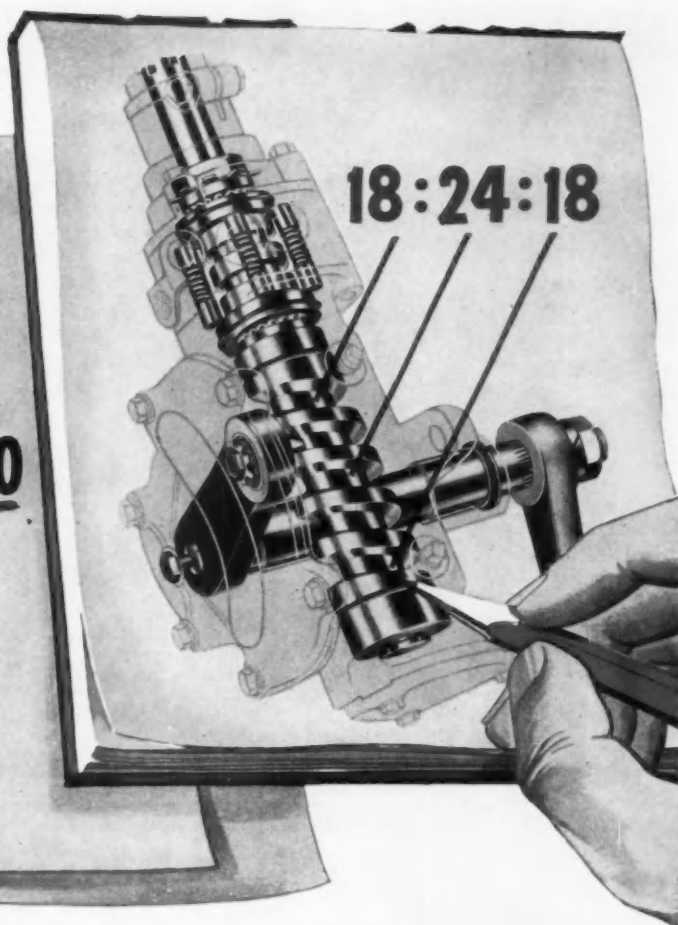
HYATT, the recognized leader in the cylindrical bearing field, is again a leading supplier of tapered roller bearings. In 1957 HYATT delivered more than 10 MILLION tapered bearings for new cars and trucks. Now, the 1958 model year is convincing proof that HYATT is the growing source for tapered roller bearings in the automotive industry.

And no wonder! HYATT'S electronically controlled production lines are turning out these millions of bearings with greater uniformity than ever before achieved in quantity production. HYATT'S know-how amassed from years of experience—plus these ultra-modern facilities—assure longer, more dependable bearing performance in any automotive application. Hyatt Bearings Division, General Motors Corporation, Harrison, N.J.; Detroit; Pittsburgh; Chicago; and Oakland, California.

# **HYATT** **HY-ROLL BEARINGS** FOR CARS AND TRUCKS



**ONLY ROSS  
GIVES YOU  
VARIABLE-RATIO  
POWER  
STEERING**



**Variable-ratio** provides with *one* steering gear alert response and maneuverability that it would take two gears, of any other type or make, to supply.

**Variable-ratio** gives faster steering and quicker recovery for turns, and slower steering and greater stability for high-speed, straight-ahead operation.

*The ratio variation, of course, can be whatever your steering job requires. For example, 18:24:18 would give you an 18 to 1 ratio for turns, and a 24 to 1 ratio for straight-ahead handling.*

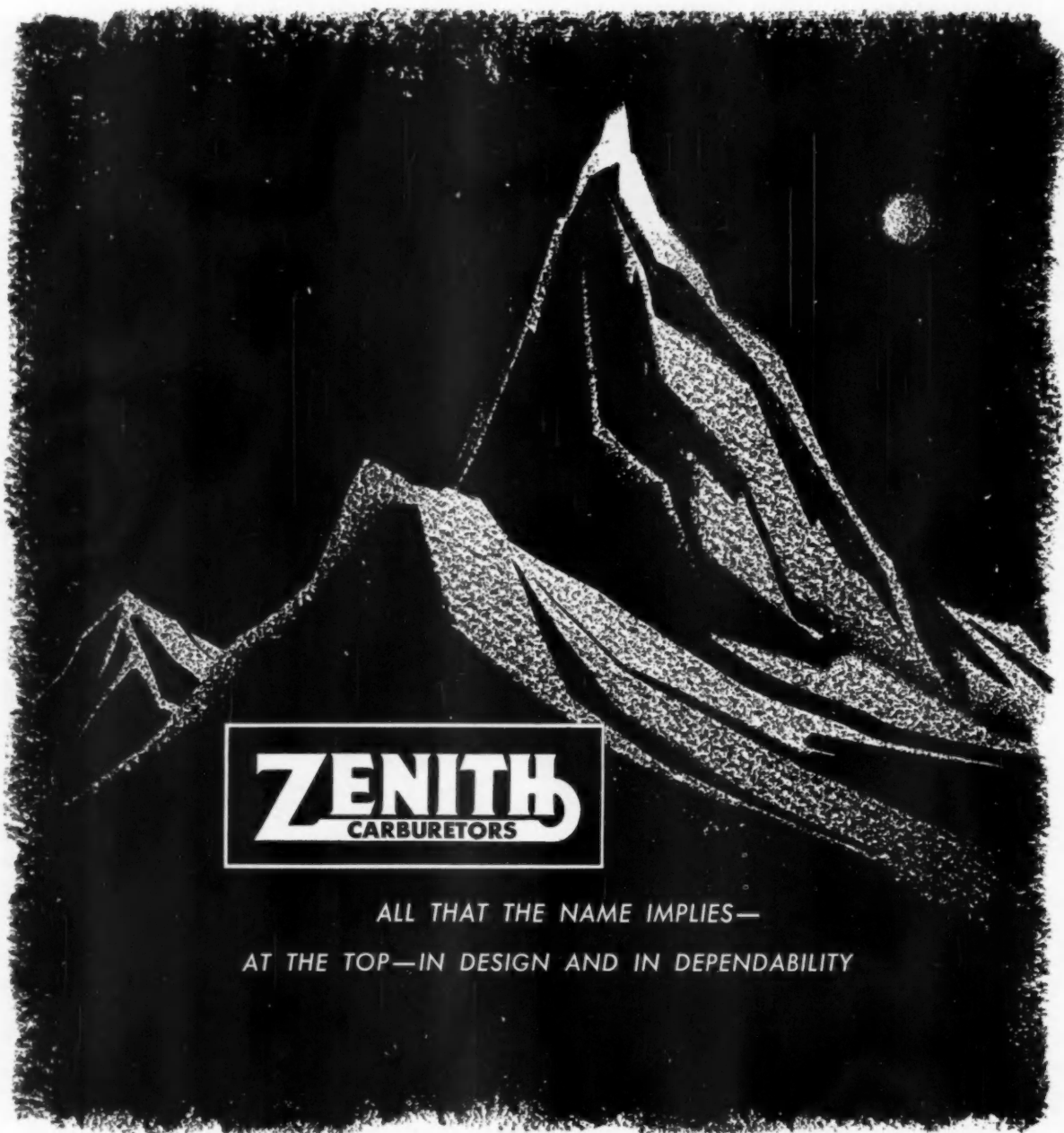
**Variable-ratio** is an exclusive feature of Ross Hydrapower power steering and Ross Cam & Lever manual steering. No other type or make of steering gear provides it.

**Ross makes all three** types of hydraulic power steering—integral, semi-integral and linkage—and invites discussion of any steering problem, power or manual, variable or fixed ratio.

## **HYDRAPOWER**

ROSS GEAR & TOOL COMPANY, INC. • LAFAYETTE, INDIANA  
Gemmer Division • Detroit

**Ross**



**ZENITH**  
CARBURETORS

ALL THAT THE NAME IMPLIES—  
AT THE TOP—IN DESIGN AND IN DEPENDABILITY

Do you need a reliable carburetor to meet your specialized requirements? Then Zenith\* Carburetor is your answer. We either have built or have the skills to build the carburetor you want—at low cost.

Our many contributions in every phase of carburetor research and development are your assurance of satisfaction. Zenith actually has more experience in more fields with more engine types than any other carburetor manufacturer!

\* REG. U. S. PAT. OFF.

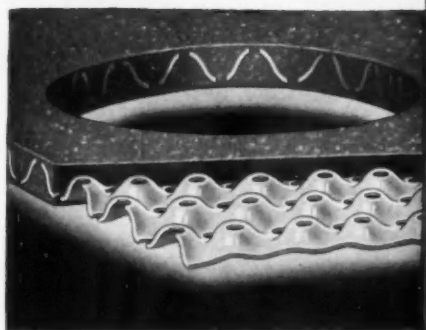
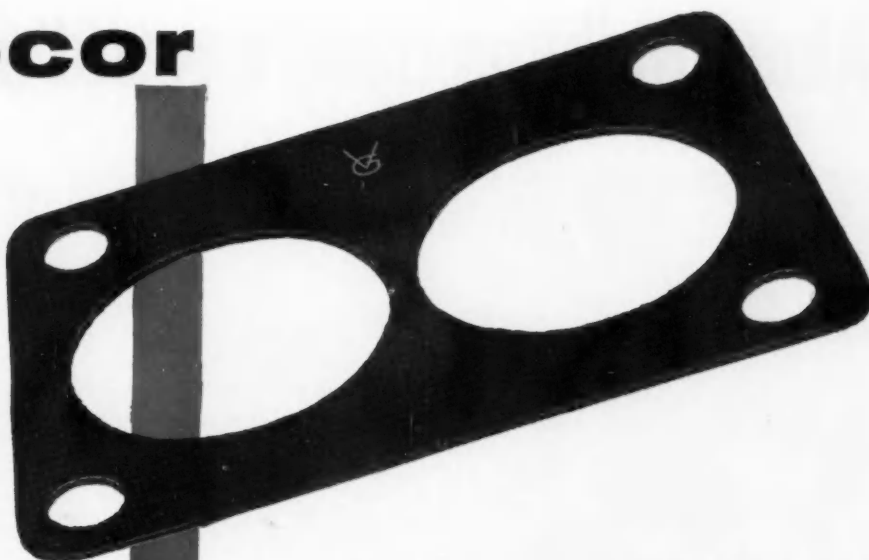
**Zenith Carburetor Division**

696 HART AVE., DETROIT 14, MICH.



# Victocor

**new  
super-  
sealing  
gasket  
material**



Cross section of **Victocor**. Thin steel core is die-formed with continuous projections alternating in each face. (Type 200 core has 800 projections per sq. in.) Sealing element layers, top and bottom, are bonded simultaneously with core into integral structure. Deep penetration of core projections increases stability and heat conductivity.

#### TYPICAL PHYSICAL PROPERTIES — TYPE 200

Thickness	.030/.035" min.
% Compressibility at 1000 psi.	*10-15
% Recovery at 1000 psi.	35 min.
% Compressibility at 5000 psi.	*16-21
% Recovery at 5000 psi.	30 min.
Service temperature	750 deg. F.
Crush resistance psi.	100,000
Corrosion resistance against aluminum, magnesium, steel and copper	Good

\*Slightly higher values are obtained with heavier gauge.

## ... where you need these maximum characteristics

- low torque loss
- high heat resistance
- high crush resistance
- high dimensional stability
- thin construction—.030/.035 gauge

**Victocor** justifies re-examination of your most exacting sealing specifications. It's a totally new product—offers more in every desirable heavy-duty characteristic.

**Victocor** was developed particularly for high-flange-pressure applications. Its steel core construction accelerates heat conductivity. It is strong and highly flexible.

Resistance to hot oils, gasoline and water is excellent, and **Victocor** positively retains all commonly used coolants.

**Victocor's** sealing element—a special asbestos-elastomeric compound—is extremely resilient. It helps compensate for mating surface irregularities. No coating is required when installing **Victocor** gaskets, and they're easily removed for replacement.

#### 4 Standard Types Available—Test Samples Free

Where can you seal better and more economically with **Victocor**? Let Victor engineers help you decide. It's available in four standard types and many modified combinations. Meanwhile, write for complete technical data and free test samples. Please mention proposed application. Address the factory, or contact your Victor field engineer.

Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill.  
Canadian Plant: St. Thomas, Ont.



# VICTOR

Sealing Products Exclusively

**GASKETS • PACKINGS • OIL SEALS • MECHANICAL SEALS**

AUTOMOTIVE INDUSTRIES, May 15, 1958

# Albee Rolligon covers world's roughest



Six individually powered, high-traction pneumatic rollers carry the Albee Rolligon most anywhere, imposing a ground load of only 5 psi at 21,000 lbs. G.V.W. Designed and built for dependable, off-the-road operation by Albee Rolligon Co. of Monterey, Calif., the ARC uses 54 feet of leakproof Bundyweld for vital fuel and hydraulic lines. And its powerful V-8 engine uses additional lengths of dependable Bundyweld for fuel and oil lines.

## BUNDYWELD IS DOUBLE-WALLED FROM A SINGLE STRIP



Bundyweld starts as a single strip of copper-coated steel. Then it's . . .



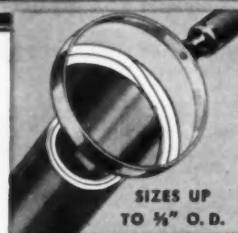
continuously rolled twice around laterally into a tube of uniform thickness, and



passed through a furnace. Copper coating fuses with steel. Result . . .



Bundyweld, double-walled and brazed through 360° of wall contact.



NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

SIZES UP TO 1/2" O.D.

# terrains . . . keeps lifelines leakproof with Bundyweld Tubing

. . . the extra-strong, leakproof steel tubing that's  
double-walled from a single strip of metal and  
copper-bonded through 360° of contact

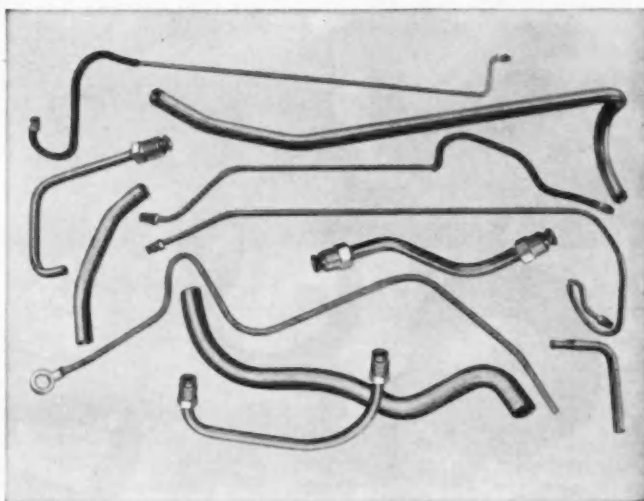
Albee Rolligons rough it with seven-ton payloads—off-the-road where other haulers can't go. Every part must stand up against the vibration and shock of going up "impossible" grades, over jagged rocks or sand.

Bundyweld Tubing is used for fuel and hydraulic lifelines — and for fuel and oil lines in its mighty V-8 engine — because Bundyweld supplies more strength and reliability where it is needed.

Leakproof by test, Bundyweld Tubing withstands heavy vibration fatigue, is dependable in the most taxing performance conditions. Stronger, yet thinner-walled, it withstands wear that ruins most tubing. That's why *Bundyweld* is used in 95% of today's cars for oil and hydraulic lines — in an average of 20 applications each!

You can count on strength and dependability when you use Bundy Tubing in your products. So take advantage of Bundy's special services: world's finest tubing-fabrication facilities; expert technical assistance; and prompt, on-schedule delivery.

For more information, write or wire today!



#### Expert fabrication service for every tubing need

These typical automotive tubing parts are just samples of how Bundy can fabricate leakproof Bundyweld Tubing — at low cost — into a great variety of complex shapes. And each has the strength and durability that makes Bundyweld Tubing famous!

## BUNDY TUBING COMPANY, DETROIT 14, MICHIGAN

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, ENGLAND, FRANCE, GERMANY, AND ITALY

*There's no real substitute for*

# BUNDYWELD® TUBING

Bundy Tubing Distributors and Representatives: **Northeast:** Chas. H. Stamm, 10 N. Main St., West Hartford, Conn.; Austin-Hastings Co., Inc., 226 Binney Street, Cambridge 42, Mass. • **Middle Atlantic:** Atlantic Tube & Metals, Inc., 451 New Jersey State Highway #23, Wayne, N. J.; Rutan & Co., 1 Bala Ave., Bala-Cynwyd, Pa. • **Midwest:** Lapham-Hickey Steel Corp., 3333 W. 47th Place, Chicago 32, Ill.; Midco Supply Company, 1346 South 20th Street, Omaha, Neb.; Williams and Company, Inc., 901 Pennsylvania Ave., Pittsburgh 33, Pa. • **South:** Pelton-Deakins Co., 823-824 Chattanooga Bank Bldg., Chattanooga 2, Tenn. • **Mountain:** M. L. Foss, Inc., 1901-1927 Arapahoe Street, Denver 1, Colo. • **Southwest:** Vinson Steel & Aluminum Co., 4606 Singleton Blvd., Dallas, Texas • **Northwest:** Eagle Metals Co., 4755 First Avenue, South Seattle 4, Wash. • **Far West:** Pacific Metals Co., Ltd., 2187 S. Garfield, Los Angeles 22, Calif.; Pacific Metals Co., Ltd., 1900 Third Street, San Francisco 7, Calif.

Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.



## PRECISION WASHERS

**For automatic transmissions  
and similar bearing applications**

Solid steel or bronze; steel faced with babbitt or copper-lead, or copper-lead on *both faces*. Flat, spherical or special shapes. Grooves, holes, nibs, scallops or lugs. O.D. 1" to 6". Wall thickness: solid, .028" to .141"; bimetal, .034" to .141". Cold rolled for heavy-duty. Large capacity. Complete engineering service.



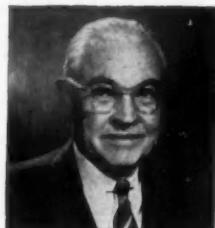
## FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

# RB&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY



## Technicalities

By John S. Davey

### Fastener coatings

Salt spray testing of various metallic coatings used on fasteners doesn't always give a true picture. In actual service, accelerated test results are not always borne out.

Reason: The tests favor the coatings which can endure continuous moisture and salt atmospheres, whereas some do better under the normal intermittent dry and wet conditions of weathering.

Experience has developed a "scale" of suitability of various coatings for fastener protection.

#### FOR RUST PROTECTION

Hot galvanizing offers greatest endurance under most conditions. It falls short on highly stressed fasteners.

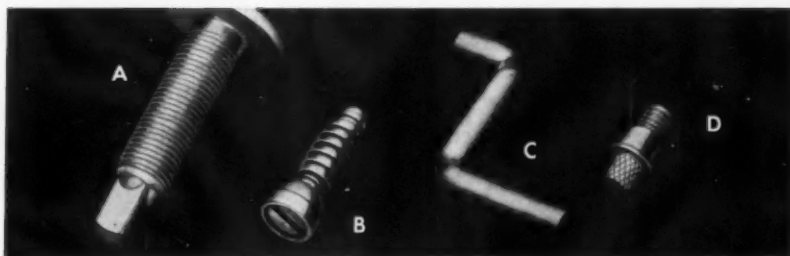
Electrodeposited zinc is next most practical—providing good appearance, controlled tolerance at threads, and ability to take high bolt tensions.

Cadmium plate stands out where salt atmospheres predominate. Not suitable for contact with edibles, it is ruled out for many appliances.

For general applications, the rust prevention of black oxide coatings proves satisfactory. Phosphate coatings, too, offer some degree of protection, but not under severe conditions.

Chromium, plated over copper, should be considered more for its appearance on fasteners rather than protection.

## Cold heading creates quality parts the low cost way



No value analysis of product components is really complete without exploring what cold heading machines can do to cut costs. Some examples:

**A. ELIMINATE EXTRA OPERATIONS.** Leveling screw, formerly made by riveting flat disc to set screw, now emerges as a stronger, single piece from a cold header.

**B. ONE PIECE BETTER THAN TWO.** Cold headed hose clamp screw has integral flange which, after head is slotted, is forced up to form screw-driver shield. Before, piece was in two parts . . . with screw made on screw machine, and the shield a stamping fitted around head during assembly.

**C. FASTER THAN FORGING.** Shifter lever is bent into double "L" automatically in bolt header . . . replacing

ing 2-stage forging operation. The header does it at high speed from continuous rod.

**D. METAL FLOWS TO SHAPE—NO WASTE.** No longer cut on screw machine, insert screw for plastic parts costs 40% less. Cold header uses just the amount of metal required. The threading and knurling, too, are done automatically at high speed.

Metal forced to cold flow into shape results not only in savings but also in stronger parts. With uncut flow lines, the piece is better able to withstand stress concentrations.

For an expert opinion on parts you now use, check with Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

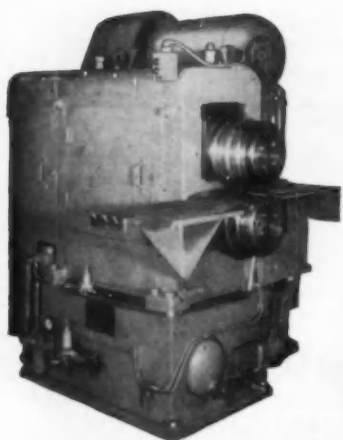
## 12-point fasteners cut wrench clearance space

Double hex RB&W bolts and nuts measure smaller across their points than single hex fasteners. Used with an external socket wrench, they permit optimum driving torque to be applied.

Thus, while permitting design of more compact assemblies, these fasteners also assure proper preloading for stronger connections.

Available with plain flange, or SPIN-LOCK design which incorporates teeth that embed upon tightening and resist loosening under vibration or temperature changes.





*from the forging roll . . .*



## **AJAX WIDE ADJUSTMENT FORGING ROLLS**

**PRE-ROLL YOUR FORGING BLANKS . . .**

**FOR METAL SAVING • LONGER DIE LIFE • BETTER FIBRE FLOW**

AJAX ROLLS are built in seven sizes to pre-roll forging blanks ranging from Connecting Rod blanks to the largest Airplane Propellers. Illustrations show Automobile Connecting Rod blank formed (above) and press-forged (below) on **AJAX HIGH SPEED FORGING PRESS**.

*. . . to the forging press*



WRITE FOR BULLETIN 91-B

THE **Ajax**

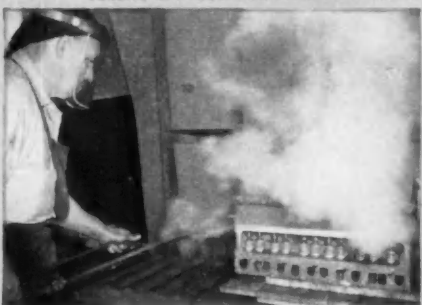
**MANUFACTURING COMPANY**  
EUCLID BRANCH P. O. CLEVELAND 17, OHIO  
110 S. DEARBORN ST., CHICAGO 3, ILLINOIS  
W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.



- 1** The buyer of a Continental "S" assembly receives full benefit of the advanced practices which maintain quality in new engines. Here spectrographic analysis is used to assure uniformity of quality.



- 2** Here gears are checked to plus-or-minus .0003, on the involute checker, while results are recorded on a continuous chart.



- 3** Live steam under high pressure removes all foreign matter from inside engine block.

- 4** End play is checked, and all lines are oil tested, just as in new engine assembly. Then bearing caps, cylinder heads, gear covers, and filler blocks are all torqued to specifications.

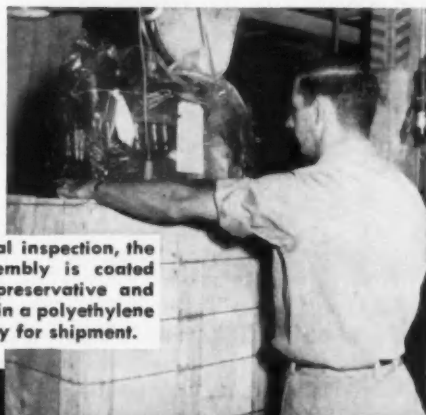


# CONTINENTAL

## "S" Assemblies

### Cut Costly Down-Time

Every model in Continental's broad line of transportation engines is now available in "S" Assembly form—basic engine complete with cylinder-and-block assembly, oil pan, cylinder head, piston and valve assemblies, crankshaft, camshaft, gear cover, bearings and caps, crank and cam gears, and front end plate, fully assembled and torqued to specifications, ready to drop under the hood in an absolute minimum of time . . . An "S" Assembly usually costs less than the full overhaul it supplants, but the clinching point in its favor is the saving it effects in costly time out of use. Whether you operate a single unit or a fleet, it will pay you to investigate. Write for information.



- 5** After final inspection, the "S" assembly is coated with a preservative and encased in a polyethylene bag ready for shipment.

**Continental**  
**Motors Corporation**

MUSKEGON • MICHIGAN



# STROMBERG



more than 40 years of outstanding performance

In specifying components for the automobiles they build, car manufacturers will do well to examine the record of the Stromberg\* Carburetor—more than 40 years of outstanding performance. Extreme **RELIABILITY** and outstanding **GASOLINE ECONOMY** are Stromberg's distinguishing characteristics. And the record proves it. Stromberg Carburetors are designed and built by Bendix-Elmira, pioneer in fuel system engineering and the *first manufacturer* to develop an electronic fuel injection system for automobiles. Owner loyalty is the auto maker's most priceless asset. Stromberg helps build owner loyalty.

\*REG. U. S. PAT. OFF.

#### HERE'S HOW STROMBERG OUTPERFORMS THEM ALL

- Economical operation, more miles per gallon, happier customers
- Fewer moving parts, fewer mechanical failures, reduced service cost
- Substantially reduced incidence of icing and percolation
- Thin aluminum throttle body and flange for quicker heat transfer

**Bendix-Elmira, N. Y.**  
ECLIPSE MACHINE DIVISION





## **GREASED-FOR-LIFE SOCKETS AND LINKAGES**

may be for the birds, but they can mean longer life and easier maintenance for your models of the future. These new Thompson products may be coming your way from Michigan Division's research centers that have made many notable contributions to easier steering and more comfortable riding. You'll want more information and we'll be happy to provide it. Just write us at 34201 Van Dyke, Warren, Michigan, or phone Jefferson 9-5500, and we'll do the rest.

You can count on



**Thompson Products**

Michigan Division: Warren and Portland

For whatever you make . . .

# **N-A-X<sup>®</sup> FINEGRAIN STEEL**

## **DELIVERS STRENGTH**

## **WITH TOUGHNESS**



No more dramatic test of a steel's combined strength and toughness could be devised than the kind of job performance which Caterpillar Tractor Co. builds into its products.

As Caterpillar equipment literally moves the earth, bulldozer blade surfaces and scraper bowl bottoms must stand up to gruelling punishment. In these critical components, Caterpillar standards for steel are of the highest. N-A-X FINEGRAIN steel meets those standards with the right combination of strength with toughness.

And to this manufacturing operation, like so many others, N-A-X FINEGRAIN brings other important benefits as well. For example, the excellent weldability of N-A-X FINEGRAIN steel makes it exceptionally adaptable to Caterpillar's exacting requirements.

**Review these salient advantages for your job:** N-A-X FINEGRAIN steel, compared with carbon structural grades,

is approximately 50% stronger • has high fatigue life with great toughness • is cold formed readily into difficult stampings • is stable against aging • has greater resistance to abrasion • is readily welded by any process • offers greater paint adhesion • polishes to a high luster at minimum cost. And the physical properties of N-A-X FINEGRAIN are inherent in the "as rolled" condition. N-A-X FINEGRAIN's resistance to normal atmospheric corrosion is twice that of carbon structural steel.

**NOTE:** Where greater resistance to extreme atmospheric corrosion is an important factor, our N-A-X HIGH-TENSILE is recommended.

For whatever you make, from tractors to pressure cylinders, with N-A-X HIGH-STRENGTH steels you can design longer life, and/or less weight and economy into your products.



*This bowl bottom assembly of the Caterpillar No. 470 Scraper requires numerous individual welding operations in its manufacture. Not only the parent metal, but the welds themselves, must have strength with toughness. Again, N-A-X FINEGRAIN steel proves its excellent weldability.*



*Here Caterpillar Earthmoving Equipment pushes America's great highway program forward. A Cat® DW 21 and matching No. 470 Scraper lead the way. The Cat DW 21 is assisted by a Caterpillar-built crawler Tractor.*



N-A-X Alloy Sales Division, Dept. J-9

**GREAT LAKES STEEL CORPORATION**

Detroit 29, Michigan • Division of



**N-A-X Alloy Sales Div., Dept. J-9**

**Great Lakes Steel Corp., Detroit 29, Michigan**

- ☐ Please send me 12-page illustrated technical catalog on N-A-X HIGH-STRENGTH steels.
- ☐ Please have your representative contact me.

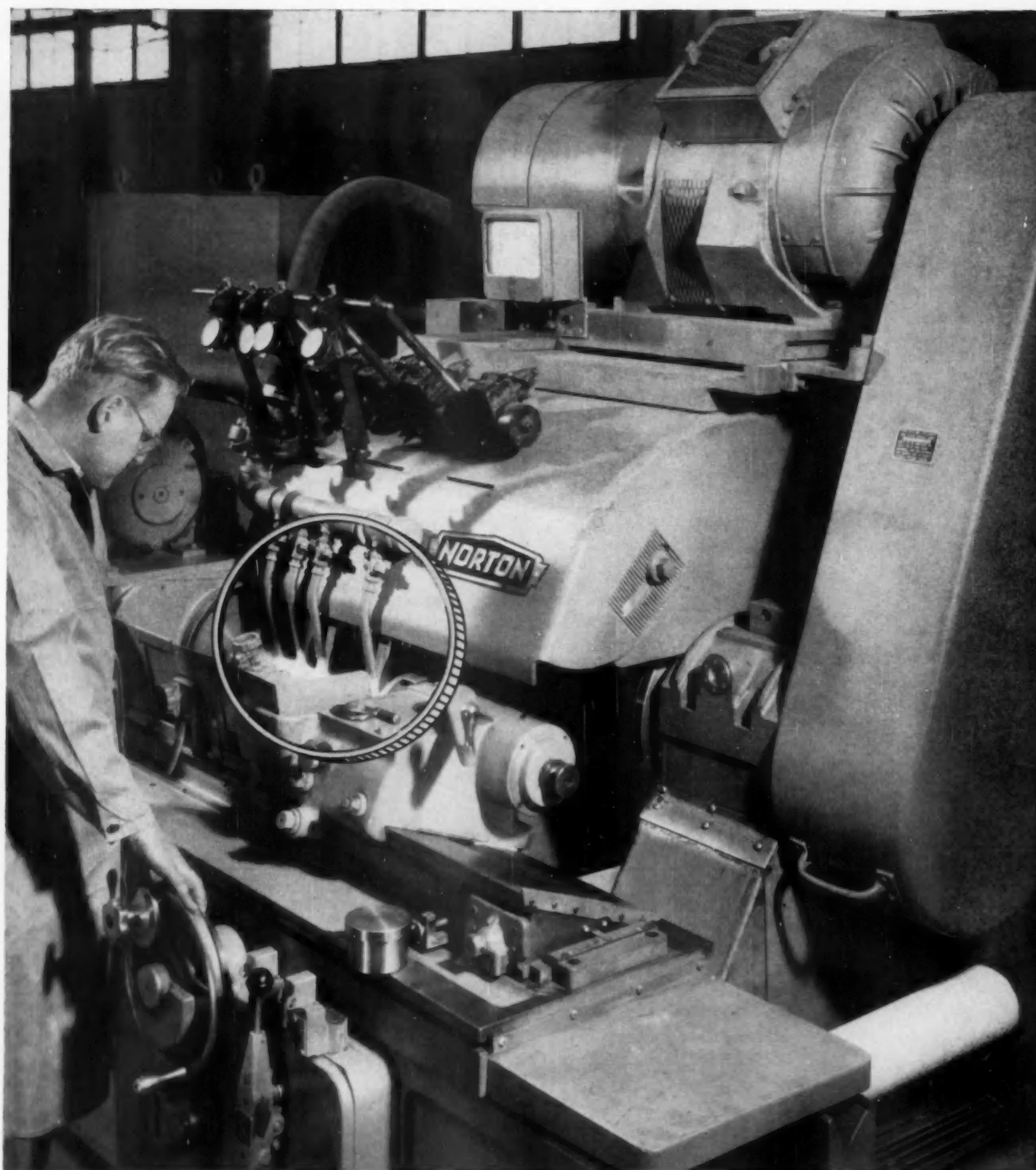
Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# Grinding multi-diameter parts



**Replacing Four Separate Grinders,** a Norton CM-1 grinds four diameters simultaneously — in a fraction of the time it used to take to finish this job. A great new production tool, the Heavy Duty Multi-Wheel CM-1 can perform even more grinding operations at once — on

crank and camshafts, transmission and motor shafts and other multi-diameter parts. The machine has also been arranged for grinding pin diameters in multiple on crankshafts with pins lying in the same plane. And power-assist loading mechanism is available for many applications.

# this fast, easy, accurate way...



*Norton Type CM-1 Multi-Wheel Grinder reduces your operating expenses and capital investment by completing several jobs at once*

You can get one grinding machine that does the work of several, in a fraction of the working time — bringing you considerable savings on purchase costs, operating costs and floor space.

That machine is the Norton Type CM-1 Heavy Duty Semiautomatic Multi-Wheel Grinder.

The CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

#### Typical Advanced Features

- Cartridge type bearings at each end of heavy, 10"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.
- Automatic truing device — in rear, out of operator's way — trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.

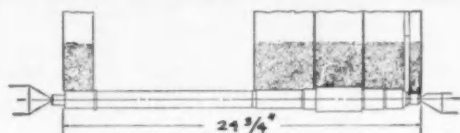
• Automatic compensation for wheel wear, and amount trued off. No adjustment or resetting of wheel needed after truing.

• Optional equipment includes built-in automatic sludge remover and coolant filter, constant peripheral wheel speed control, automatic work loading and unloading equipment.

Why not get the complete story of how the CM-1 can bring the cost-reducing, profit-boosting "Touch of Gold" to your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

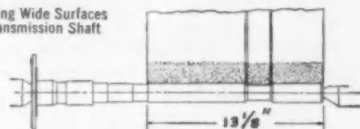
To Economize, Modernize with NEW

**NORTON**  
GRINDERS and LAPPERS

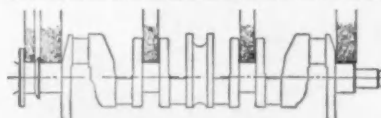


Combining Five Cuts on Transmission Shaft

Grinding Wide Surfaces on Transmission Shaft



Plunge Grinding Five Camshaft Bearing Diameters



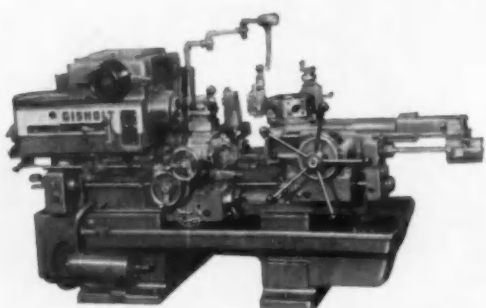
Grinding Line-Diameters on Automotive Crankshaft

**Versatility that Meets Many Needs.** On the CM-1, workpieces can be up to 36" in length. As shown in these four typical diagrams, grinding wheels can be located, close together or far apart, as required. And regardless of the number of wheels in any group, their combined widths — plus spacing collars — can total up to 30", exceeding the widest group

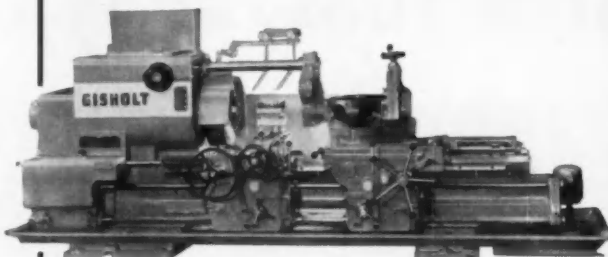
shown here. This Norton-engineered versatility brings progress and profits to your diameter grinding — because with the CM-1 you can actually finish a group of line-diameters in approximately the time you've been spending on a single diameter grind.

**Making better products . . . to make your products better**

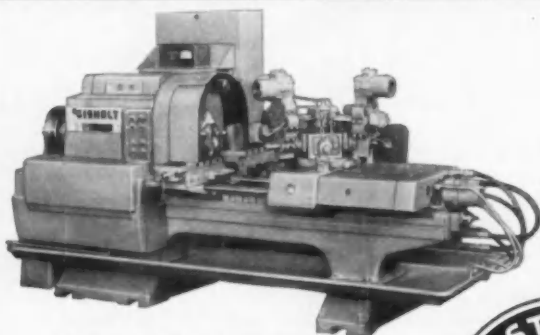
NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes  
District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit — In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.



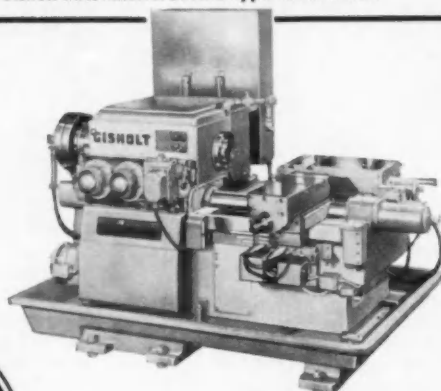
Gisholt MASTERLINE Universal Ram Type Turret Lathe



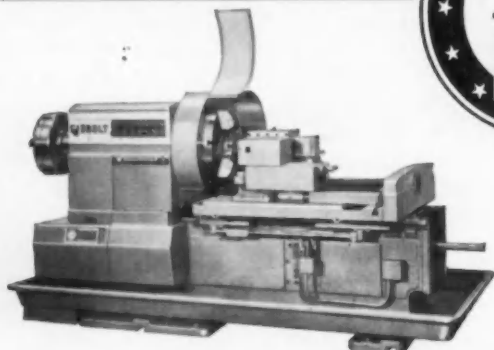
Gisholt MASTERLINE Saddle Type Turret Lathe



Gisholt MASTERLINE Fastermatic Automatic Turret Lathe

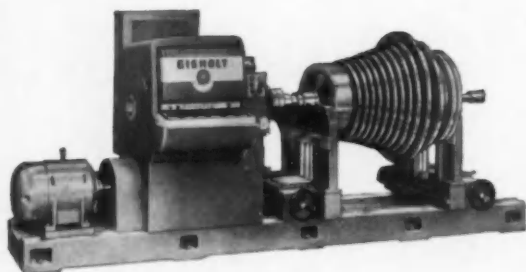
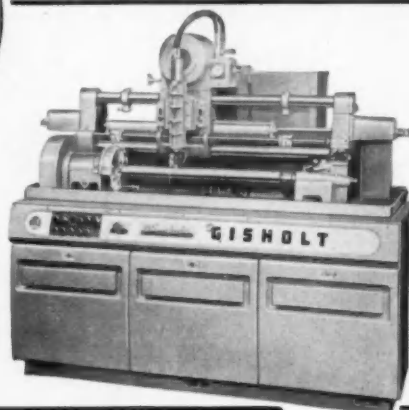


Gisholt MASTERLINE No. 12 Automatic Lathe



Gisholt MASTERLINE Simplimatic Automatic Lathe

Gisholt  
MASTERLINE  
Super-  
finishing  
Machine



Gisholt MASTERLINE Balancing Machine

The illustrations on this page show the seven basic lines built by the Gisholt Machine Company. A General Catalog, Form 1126-K, with complete specifications and basic information on the Gisholt MASTERLINE Machines, is available on request. Direct your inquiry to:

## GISHOLT MACHINE COMPANY

1205 East Washington Ave., Madison 10, Wis.

# Save 27% or more in cost...

## NEW

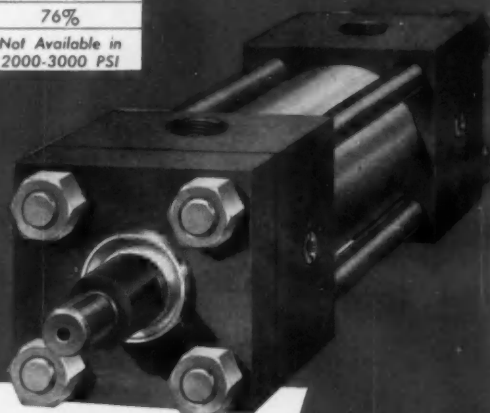


## "JOB RATED"

### HYDRAULIC CYLINDER LINE

with **IDENTICAL** seals, design, and safety factors as the famous Miller "Power-Packed" Model "H" Line for 3000-5000 psi service.

JOB RATED, MODEL "J"			
BORE	SEVERE OPERATING CONDITIONS	MODERATE OPERATING CONDITIONS	YOU SAVE THIS % IN PRICE OVER STANDARD 2000-3000 PSI CYLINDERS
1 1/2"	1500 PSI	2500 PSI	27%
2	1500	2500	27%
2 1/2	1000	1500	28%
3 1/4	1500	2500	32%
4	1000	1500	35%
5	800	1200	37%
6	800	1200	43%
8	500	800	50%
10	500	800	71%
12	500	800	76%
14	500	800	Not Available in 2000-3000 PSI



## SEAL FAILURE MEANS CYLINDER FAILURE!

1. No seal made of synthetic rubber is compatible with even 50% of available, commercial, petroleum base hydraulic fluids.

**MILLER Uses All Teflon\* Seals to Eliminate External Oil Leakage** because Teflon is impervious to all known hydraulic fluids, even fire-resistant types.

#### TEFLON SHEF SEAL At Tubing Ends

No blind assembly. Is  
**Shear-proof**  
**Heat-proof**  
**Extrusion-proof**  
**Fluid-proof**

#### TEFLON Seals On Piston Rod And Bushing

Teflon rod flange seal requires no adjustment. Teflon bushing seal is shearproof. Teflon wiper keeps dirt out.

#### TEFLON Seals On Ball Check And Adjusting Screw

Non-protruding, self-locking, cushion adjusting screw interchangeable with ball check for easy access.

**MILLER Uses Resin-Impregnated Leather Piston Cup Seals** because they are compatible with petroleum base fluids and some fire-resistant types. Teflon cups available at small extra cost.

2. Nicked or scored piston rods cause seal failure

**MILLER Uses Case-Hardened Chrome-Plated Piston Rods** because they prevent nicks, scoring and rust.

**NOW!** . . . You can save **MORE** with quality Miller "Job-Rated" Cylinders than with cut-price, lesser quality hydraulic cylinders. And the "Job-Rated" Cylinders are also available under the same immediate shipment program as the Power-Packed Line (2 hours if necessary—3 days normal).

\* Du Pont trademark on tetrafluoroethylene resin which withstands temperatures from -100° F. to +300° F. and all hydraulic fluids.


#### OTHER MILLER QUALITY FEATURES

- Rust-Resistant Surfaces
- Interchangeable, Space-Saving Square, 4-Tie-Rod Design
- Precision Honed Barrels

## MILLER FLUID POWER

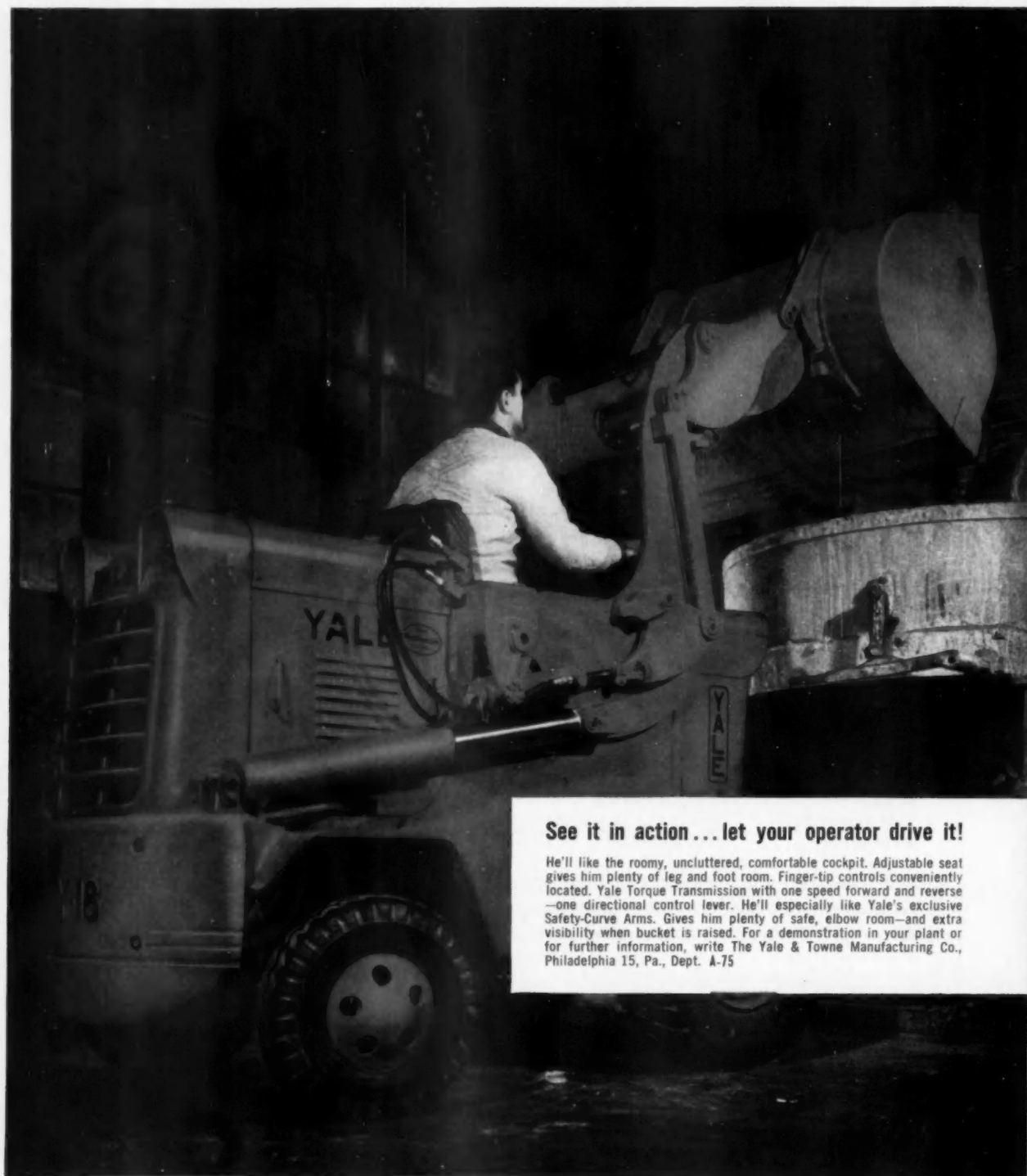
DIVISION OF FLICK-SEEDY CORPORATION

2028 N. Hawthorne Ave., Melrose Park, Illinois

AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS  
COUNTERBALANCE CYLINDERS • BOOSTERS

YALE introduces...the INDUSTRIAL tractor shovel

# DESIGNED TO GIVE YOU 25%



**See it in action...let your operator drive it!**

He'll like the roomy, uncluttered, comfortable cockpit. Adjustable seat gives him plenty of leg and foot room. Finger-tip controls conveniently located. Yale Torque Transmission with one speed forward and reverse—one directional control lever. He'll especially like Yale's exclusive Safety-Curve Arms. Gives him plenty of safe, elbow room—and extra visibility when bucket is raised. For a demonstration in your plant or for further information, write The Yale & Towne Manufacturing Co., Philadelphia 15, Pa., Dept. A-75

# MORE WORK EVERY HOUR

## through these exclusive Yale features...

- Yale Torque Transmission (fully automatic)
- 45° ground-level bucket tipback
- Safety-curve arms
- Accelerates to operating speed of 8 mph. in 3.5 seconds—to a speed of 13 mph. in 5.5 seconds
- 6 foot dumping clearance
- Sealed brakes
- Front and rear operating lights

At last—a tractor shovel designed especially for industry! Whether you handle bulk chemicals, sand, gravel, scrap or raw materials, you'll get more productive work at less cost per work unit with this new concept in a tractor shovel.

Yale designed it for tight areas—built it *compact* (only 117" overall length) so that it can maneuver in any aisle wide enough for a wheelbarrow. *Accelerates to an operating speed of 8 mph. in 3.5 seconds and to a top speed of 13 mph. in 5.5 seconds.* Exclusive *Yale Torque Transmission (fully automatic)* permits quicker, smoother starting, eliminates shifting, provides more

power under load conditions—in a word, *speeds cycle operations.* This extra speed, plus the greatest carrying capacity of its class (full 2500 lbs.) means *up to 25% more work per hour.*

Yale's loader-linkage design offers unique advantages. Exclusive 45° *Ground-Level Tipback* insures the ultimate in loading action—and a grade-level carrying position to minimize spillage. Exclusive 6 foot *Dumping Clearance* is highest on any model of similar wheel-base. Bucket is *Automatically Self-Locating.* Operator merely lowers from full dump-position to ground-level—bucket automatically returns to digging position.

a product of Yale's integrated design—these engineering advances are standard features

- Gasoline; LP-Gas powered
- Sealed hydraulic system—keeps dirt out
- Pre-cleaner—air cleaner combination
- Extra strong heavy welded steel frame—greater safety, longer life
- Automatic bucket return to digging position
- Carrying capacity of 2500 lbs.—bigger load capacity
- Short wheel base—minimum turning radius
- Sealed generator and distributor
- Balanced weight distribution
- Maximum speeds up to 13 mph.



# YALE\*

\*REG. U.S. PAT. OFF.

**YALE & TOWNE**

## INDUSTRIAL LIFT TRUCKS & TRACTOR SHOVELS • HOISTS

GASOLINE, ELECTRIC, DIESEL & LP-GAS INDUSTRIAL LIFT TRUCKS • WORKSAVERS  
WAREHOUSERS • HAND TRUCKS • INDUSTRIAL TRACTOR SHOVELS • HAND AND ELECTRIC HOISTS

YALE MATERIALS HANDLING DIVISION, THE YALE & TOWNE MANUFACTURING CO. MANUFACTURING PLANTS: PHILADELPHIA, PA.; SAN LEANDRO, CALIF.; FORREST CITY, ARK.

# Buy 10%-15% longer bearing life with

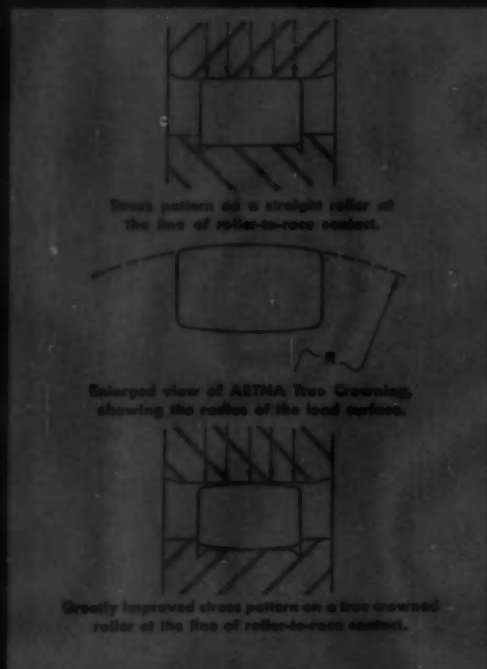
## Aetna

## TRUE CROWNED Roller Bearings

Competitive tests of AETNA *True Crowned* Roller Bearings with standard roller bearings by leading machinery builders on identical equipment, with identical load stresses, proved conclusively, time and time again, that AETNA True Crowned Roller Bearings have a 10% to 15% longer service life.

There is no premium for this True Crowned bearing surface. AETNA engineers recommend True Crowned rollers because this design provides the best distribution of stresses across the full length of the roller. You simply buy longer service life at the same cost by specifying AETNA.

*The reason for longer bearing life is apparent in these drawings:*



Each roller incorporated into AETNA Roller Bearings is carefully ground to a fine finish with a large radius to relieve the high stress point present where two cylindrical bodies are in rolling contact and under load. The crown radius is scientifically determined and varies with the size of the roller.

AETNA stocks pure radial cylindrical roller bearings, and is equipped to supply pure thrust or special types with standard, precision or super-precision tolerances in special alloys to give longer life to your products. Call your local AETNA representative listed in the yellow pages of your Classified Phone Book, or write today for General Catalog and Engineering Manual—new 15th Edition.

## Aetna

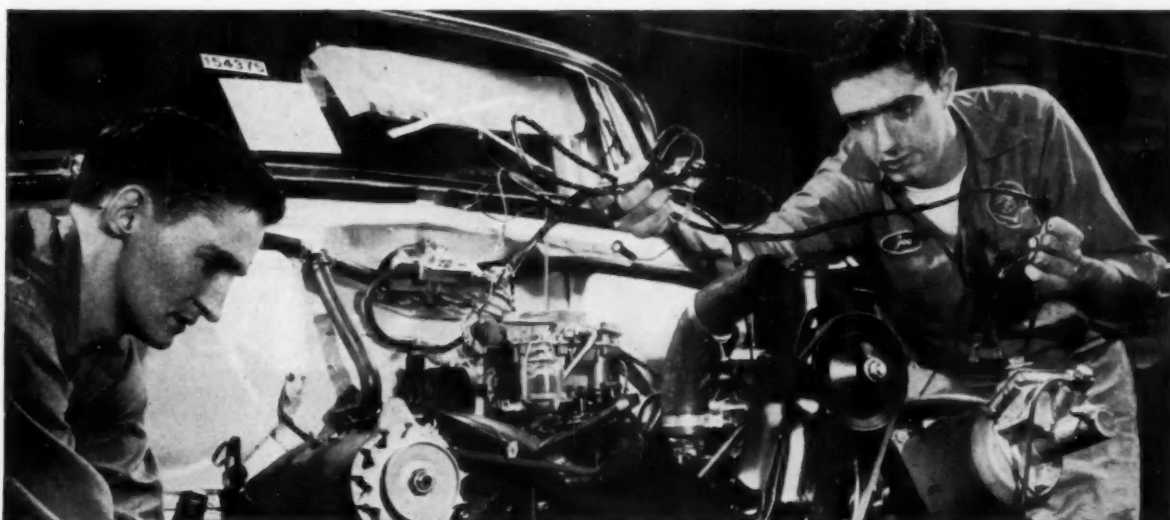
### AETNA BALL AND ROLLER BEARING COMPANY

DIVISION OF PARKERSBURGH-AETNA CORPORATION • 4600 SCHUBERT AVE. • CHICAGO 39, ILL.

IN DETROIT—SAM T. KELLER, 1212 FISHER BUILDING



**FACT** / *The extra care Packard takes here!*



**RESULTS** / *In extra savings for you here!*

When you snap on a Packard Electric wiring harness, you know *it's right!* Packard Electric harness designers have worked closely with you and your component-part suppliers, so when the assembly line is reached, everything keeps going like clockwork.

Another thing about Packard Electric wiring harnesses: All the parts are made and assembled at Packard.

This provides a quality control that is unique in the cable industry, and results in saving you money, time and trouble. What's more, every tenth Packard Electric employee is a fully trained inspector who uses the latest testing mechanisms, plus his own experience, to give you perfection in every unit.

If you are not already using Packard harnesses, as many automotive

manufacturers do, it will pay you to start doing so soon. Packard Electric maintains offices in Detroit, Chicago and Oakland, California, for your convenience.

**Packard Electric**

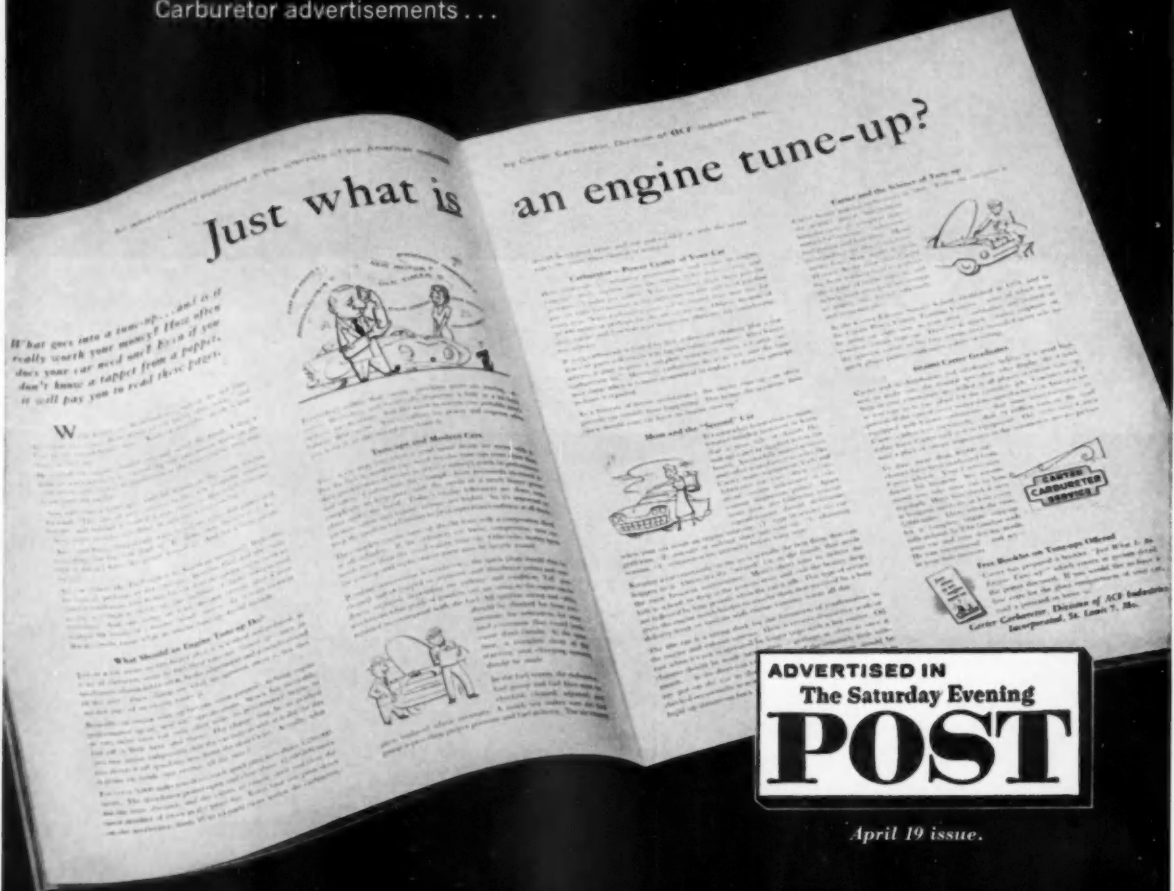
Warren, Ohio



"Live Wire" division of General Motors

# You saw it in the Post!

Another two-page spread in the continuing series of powerful Carter Carburetor advertisements . . .



ADVERTISED IN  
The Saturday Evening  
**POST**

April 19 issue.

. . . telling your story and selling your services to the American motoring public.

## Tie in now to build your business

See your Carter Supplier for reprints of this Post Ad and details on tune-up booklets for your customers.

**CARTER CARBURETOR**  
DIVISION OF **QCF INDUSTRIES, INCORPORATED** • ST. LOUIS 7, MISSOURI

# NEW FROM DU PONT RESEARCH

Remarkable, resilient **FAIRPRENE**<sup>®</sup> performs continuously to 500°F; resists fuels, lubricants, solvents and harsh chemicals

## PHYSICAL PROPERTIES

	Original	After 72 hrs. in dry air at:	
		450°F	500°F
Tensile strength	1410	1270	1173
Elongation, Ultimate, %	200	153	153
Durometer, Shore A	75	75	80

Tests were made on new "Fairprene" fluoroelastomer sheet stocks of .043" gauge and 24" width. Tests show excellent maintenance of basic properties to 500°F.

Now, Du Pont research has developed an elastic, resilient material—"Viton" A fluoroelastomer—with remarkable high-temperature and chemical resistance. In tests, "Fairprene"\* sheet stocks and coated fabrics of this new material for gasketing and diaphragm show excellent maintenance of basic properties at 500°F. This new "Fairprene" resists acids, alkalies, ozone and weathering. It resists swelling and deterioration in solvents, oils, lubricants and fuels. For more information about these new "Fairprene" sheet stocks and coated fabrics of amazing "Viton" A\*, mail the coupon—no obligation.

## IMMERSION TESTS

Fluid or Fuel Specification	Temperature level—°F	Volume swell—%
JP-4 Fuel (Kerosene-base jet fuel)	212	1.7
JP-5 Fuel (Kerosene-base jet fuel)	350	5.9
Univis J43 Hydraulic Fluid (Oil type)	500	5.9
Turbo Oil #15 (Diester-type lubricating oil)	500	16.0
ASTM #3 Oil (Petroleum base, low aniline point oil)	500	8.5
ASTM #1 Oil (Petroleum base, high aniline point oil)	500	0.0
OS45 (Silicate ester base hydraulic fluid)	350	6.5
SR6 (High aromatic test fluid)	Room Temp.	3.4
SR10 (High aliphatic test fluid)	Room Temp.	0.0
Benzol (Basic aromatic hydrocarbon solvent)	Room Temp.	19.3

Tests were made on new "Fairprene" fluoroelastomer sheet stock of .043" gauge and 24" width. Information on fluids or fuels not included can be developed by our laboratory on request.

## DU PONT INDUSTRIAL COATED FABRICS SHEET STOCKS • CEMENTS



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

"Fairprene" is Du Pont's registered trademark for its coated fabrics, sheet stocks and cements. "Viton" A is Du Pont's registered trademark for one of its synthetic rubbers.

Mail coupon now for more information about new "Fairprene" with amazing "Viton" A

E. I. du Pont de Nemours & Co. (Inc.)  
Fabrics Division, Dept. AI-85, Wilmington 98, Delaware

Please send me more information on this new "Fairprene" with remarkable high temperature and chemical resistance.

Name \_\_\_\_\_ Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



**Balls  
of Steel  
Stainless Steel  
Brass, Bronze  
Monel Metal  
and  
Special  
Materials**

*for  
Over  
40  
Years*

**Strom STEEL BALL CO.**  
Largest Independent and Exclusive Metal Ball Manufacturer

**ERWIN, TENNESSEE • TELEPHONE ERwin 2-1141**

Pacific Coast Representative: R. J. SCHENK, 716 South Main Street, Santa Ana, Cal.

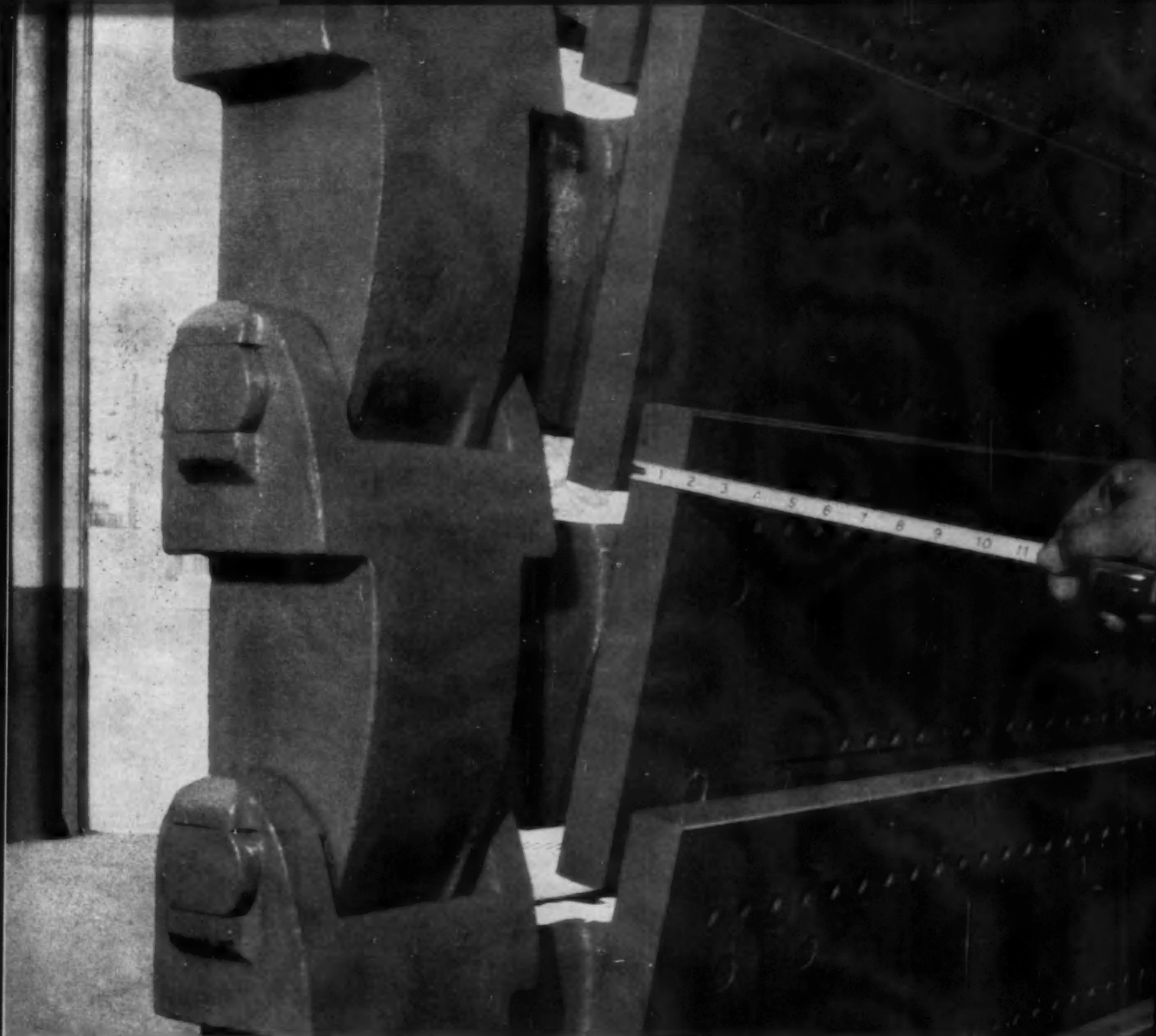
Southwestern Representative: E. E. GRAHAM & CO., 3902 Navigation Blvd., Houston 3, Texas

Chicago Representative: ROBERT YOUNG, Telephone Blshop 2-1760

## CALENDAR

### OF COMING SHOWS AND MEETINGS

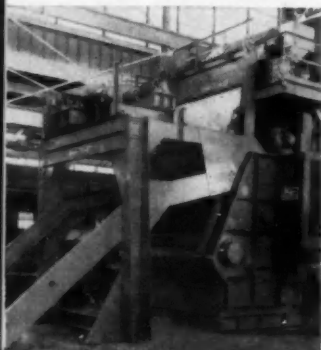
- American Petroleum Institute, Central Committee on Highway Transportation Conference, Roosevelt Hotel, New Orleans, La. ....May 18-21
- Society of Aeronautical Weight Engineers, Inc., Belmont Plaza, New York, N. Y. ....May 19-22
- American Foundrymen's Society, 1958 Foundry Show, Cleveland Public Auditorium, Cleveland, O. ....May 19-23
- International Federation of Automobile Engineers and Technicians, International Technical Congress, Paris, France...May 19-28
- National Science Foundation Conference on Research and Development, Shoreham Hotel, Washington, D. C. ....May 20
- Powder Metallurgy Parts Manufacturers Association meeting, Greater Pittsburgh Airport Hotel, Pittsburgh, Pa. ....May 21-22
- Indianapolis Race, Indiana .....May 30
- Industrial Research Conference, sponsored by Columbia University, Dept. of Industrial and Management Engineering, Arden House, Harriman, New York .....June 1-6
- Magnesium Association, West Coast symposium on magnesium applications in aircraft and missiles, Institute of Aeronautical Sciences Bldg., Los Angeles, Calif. ....June 4-5
- American Petroleum Institute, Division of Production, midyear committee conference, Hollywood Beach Hotel, Hollywood, Fla. ....June 8-13
- SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. ....June 8-13
- ASME Materials Handling Conference, Public Auditorium, Cleveland, O. ....June 9-12
- Fourth International Automation Exposition and Congress, New York Coliseum, New York, N. Y. ....June 9-13
- ASME Semi-Annual Meeting, Hotel Statler, Detroit, Mich. ....June 15-19
- American Society for Testing Materials, 61st annual meeting, Hotels Statler and Sheraton Plaza, Boston, Mass. ....June 22-27
- Society of the Plastics Industry, Inc., Midwest Section Conference, French Lick-Sheraton Hotel, French Lick, Ind. ....June 26-27
- SAE National West Coast Meeting, Ambassador Hotel, Los Angeles, Calif. ....Aug. 11-14
- American Astronautical Society, Inc., Annual Western Regional Meeting, Stanford University, Dinkelspiel Auditorium, Palo Alto, Calif. ....Aug. 18-19
- Western Electric Show and Convention, Pan Pacific Auditorium, Los Angeles, Calif. ....Aug. 19-22



## BUILT BIG . . . TO CLEAN BIG

**Giant Pangborn unit Rotoblasts loads up to 12,000 lbs. in minutes!**

A side view of the 72 cu. ft. Pangborn Rotoblast Barrel. Pangborn Barrels available in 1½, 3, 6, 12, 18, 20, 32, 72 and 102 cubic foot sizes



How do you build a giant blast cleaning barrel? If you're Pangborn, you use steel, inches thick. You put in the heaviest apron conveyor ever made. You incorporate the patented abrasive separator, abrasive-tight door, simplified Pangborn construction. You power it with two Rotoblast wheels that hurl 60 tons of abrasive an hour.

Sure, it's tough to build . . . but it's worth it when you come up with a 72 cu. ft. Pangborn Rotoblast® Barrel! This unit cleans 6-ton loads in five minutes and gives the lowest operating

and maintenance costs in the blast cleaning field! It's one of many Pangborn Rotoblast Machines. There's one for *your* problem.

*The Pangborn Engineer in your area will be glad to take off his coat and go to work on your cleaning problem at no obligation. And for complete information on Rotoblast Barrels, write to: Pangborn Corp., 3900 Pangborn Blvd., Hagerstown, Md. Manufacturers of Blast Cleaning & Dust Control Equipment.*



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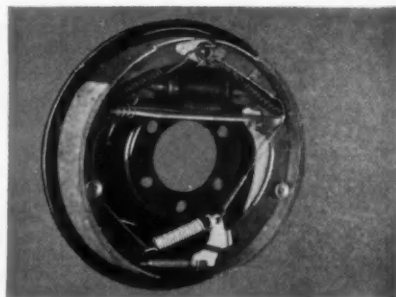
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Mercury and Edsel for 1958 feature Bendix' latest development—brakes that adjust themselves!

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## High Spots of This Issue

### ▼ Chromium Plating At Cadillac

A recently developed bright, crack-free chromium plating process has proved itself superior to previous plating methods used at Cadillac. The new technique, which is now being used to plate about 40,000 parts a day, is discussed here. Page 48.

### ▼ New Method for Producing Turbine Wheels

A revolutionary method of producing turbine and compressor rotors for jet engines and gas turbines has been developed by the Engineering Research Office of Ford Motor Co.. The new technique, which employs the principle of hot extrusion forging, is covered in this article. Page 51.

### ▼ Turning Transmission Parts on Tracer Lathes

Until recently transmission parts at the Transmission Div. of Clark Equipment Co. were machined on fairly conventional setups on older automatic lathes. Now Fisher-type New Britain tracer lathes have been installed to speed up the process. Page 52.

### ▼ Indianapolis Race Preview

Everything is in high gear for the running of the 42nd Annual Speed Classic at Indianapolis on May 30. Fifty-six cars are scheduled to battle it out. Here is an authoritative, on-the-spot preview of the race, with the lowdown on the latest engineering changes in this year's entries. Page 54.

### ▼ Zinc Die Castings Abound in 1958 Cars

Car makers report a dramatic increase in their use of zinc for 1958 models. This article discusses the latest trends in the use of zinc die castings, which form the primary zinc market for the automobile industry. Page 62.

### ▼ 45 New Product Items

#### And Other High Spots, Such As:

Perkins automobile Diesel; Powder Metallurgy Meeting; annual meeting of AWS; coordination between engineering and manufacturing; Buick engine plant; testing for leaks in air suspension system; automation conference; and Italian suspension systems.

### AUTOMOTIVE INDUSTRIES COVERS

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# News

## OF THE AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 118, No. 10

May 15, 1958

### Chrysler Takes On New Look In Sweeping Reorganization

In a vast, sweeping move Chrysler Corp. has drawn up a new corporate level organizational chart with many key personnel changes and a new philosophy of centralized operation.

The changes were announced by president L. L. Colbert at the April meeting of the board of directors.

Key move is the elevation of William C. Newberg to the post of executive vice-president. This makes him third man in the corporation behind Colbert and E. C. Row, formerly executive veep and now first vice-president. But the move puts Newberg in line for eventual promotion to the top job, since he is 16 years younger than 63-year-old Row.

Under the new set-up, virtually all Chrysler vice-presidents and group executives report directly to Newberg. The exceptions are James C. Zeder and C. L. Jacobson, who report directly to the president, and John P. Mansfield, formerly head of Plymouth Div. and now on Row's staff as a corporate vp.

Five new corporate vice-presidents were elected: Byron J. Nichols, group vice-president—automotive sales; Robert P. Laughna, vice-president—corporate planning staff; Harry E. Chesebrough, general manager of Plymouth; J. B. Wagstaff, general manager of De Soto; and C. E. Briggs, general manager of Chrysler and Imperial divisions.

The fourth passenger car division, Dodge, continues to be headed by vice-president M. C. Patterson.

But these divisional general managers will have no say in the manufacture of the products they must sell. All manufacturing and plant managers report to group executive F. M. Glassford, Jr., who in turn reports to R. S. Bright, vice-president—



### CHRYSLER UNVEILS NEW DARTLINE SERIES

*The Windsor Dartline, a new Chrysler series which features exclusive front, side, and rear trim plus three new exterior colors, is now on display in dealer showrooms. The series includes sedan, two- and four-door hardtop, and Town and Country station wagon models.*

automotive manufacturing group.

This will give the corporate staff a tighter control on manufacturing cost and quality control, and will leave the division heads free to devote more time to sales, service and divisional advertising.

Even in these fields, however, there will be direction from the corporate level. E. C. Quinn, former head of Chrysler and Imperial divisions, has moved over to the central staff as general sales manager—automotive products, and Richard E. Forbes continues as director of corporate advertising and sales promotion and now will coordinate divisional sales promotion and advertising.

William J. Bird takes on new responsibilities in dealer enterprise operations, service development and training, and market analysis and research.

These three men report to Nichols in the sales group.

Under Bright in the automotive manufacturing group are three group executives. In addition to Glassford, they are L. B. Bornhauser, heading the power train group with the Engine, Axle and Transmission, Elec-

trical Equipment and Forge and Foundry Divs.; and corporation vice-president John E. Brennan as group executive in charge of Stamping and Parts and Equipment Manufacturing Divs.

L. I. Woolson, former head of the De Soto Div. is director of manufacturing services on Bright's staff.

Other changes were announced, and numerous additional changes anticipated. The first of these secondary changes came when Patterson announced the appointment of Lee F. Desmond to the newly created position of assistant general manager of Dodge cars and trucks and the appointment of John B. Naughton as Patterson's executive assistant.

### More Color Anodized Aluminum Will Appear on 1959 Models

Customers can expect more color anodized aluminum trim on 1959 automobiles. Gold side trim and interior trim will abound, and more color treatment, says one industry observer. Reason for increased use of anodizing trim is that anodizing cost has been reduced on some pieces.

# News

## AUTOMOTIVE AND AVIATION



### THUNDERBIRD CONVERTIBLE

*Thunderbird convertible recently introduced by Ford Motor Co. is companion to firm's four-passenger Thunderbird hardtop. Convertible's soft top folds back inside trunk, but rear deck must be raised and lowered manually. Like the hardtop, the convertible model has a 300-hp V-8 engine with a 352 cu in. displacement and a 10.2 to 1 compression ratio. It is 17 ft long, 77 in. wide and 52.5 in. high, has a 113-in. wheelbase, and a shipping weight of 3733 lb, 25 lb more than the hardtop.*

### UAW, Big Three Lay Out Cards, Peaceful Settlement Expected

The United Auto Workers and the Big Three have laid their cards on the bargaining table and the showdown will come sometime after June 1. From all appearances, the automobile companies are holding the trump cards.

The union made public its latest demand on April 28, when it asked for a three-month extension of current contracts to permit further negotiation. This would make the expiration dates fall during the early days of September, when the companies would be vulnerable to a strike. In its demand, the union also asked for a joint effort to obtain a retroactive moratorium of automobile excise taxes, and a "significant" reduction in car prices.

The Big Three promptly said "no" to the union's latest demand.

In replies that indicated close top-level communication among Ford, General Motors and Chrysler executives and negotiating teams, the companies offered a two-year extension of current contracts. This would guarantee UAW members a seven-cent

hourly increase in each of the two succeeding years.

All chances for a strike now seem to have vanished. Dealer stocks are still high (more than 60 days) and UAW coffers are seriously depleted by the lack of dues income from an estimated 350,000 unemployed members. The union, in fact, has cut salaries of its top officials in an economy move.

All this points to a settlement shortly after June 1. Settlement probably will be for a two-year extension of current contracts, with perhaps a two-cent basic wage increase and SUB improvements. The total package will not amount to 10 cents an hour. There will be other clauses pertaining to individual companies, such as work standards at Chrysler and seniority at Ford, but basically the contracts will read about the way they do now.

### Studebaker Readies Small Car For 1959 Model Introduction

Studebaker-Packard Corp. is planning to bring out a new, smaller car in 1959 to capture a share of the growing market for smaller vehicles.

S-P president Harold E. Churchill announced a "different type of car" at the corporation's annual stockholders meeting last month in South Bend.

No details were given, except that the car will be smaller than the current Scotsman. Mr. Churchill said the car "retains the elements of full-size passenger space" with more permanence of design and higher resale value.

S-P generally was not expected to make a major change in 1959, but an analysis of the company's report for the last fiscal year shows nearly \$50 million in working capital that can be used to tool for a new model. S-P undoubtedly will concentrate heavily on its new short wheelbase model in an attempt to gain a bit of the small car success currently enjoyed by Rambler.

The small Studebaker, in fact, is expected to have a wheelbase of 108 in., the same as the Rambler Super and Custom, backbone of the AMC line. The 1958 Scotsman has a wheelbase of 116.5 in.

Mr. Churchill indicated an operating loss for S-P for the first quarter of 1958. Sales, however, were showing some encouraging signs—market penetration compares favorably with the percentage S-P held a year ago.

S-P registered sales gains during four successive 10-day periods in March and April, reaching its highest market penetration of the year in early April.

Mr. Churchill predicted industry production of from 4 to 4.5 million passenger cars in 1958, based on current production rates.

### Possible Plant Sites Named For Small Car Production

One important question being considered by small car study teams at Ford Motor Co. and General Motors is where to build the short wheelbase cars, once the green light is given.

Ford Motor Co. is planning unit body construction for its small car, and this should influence the plant decision. Wixom, for instance, currently is building unitized Lincolns and Thunderbirds, and therefore is set up to handle the small car assembly. Ford also is setting up its new Loraine, O., assembly plant for unit construction, or at least one assembly line at the plant.

Since the engine for the small Ford most likely will be built in Ohio, presumably at Lima, the Loraine location would work out well geographically.

Of course, if Ford sets its sights high enough in aiming for small car sales, it might well require both plant locations.

General Motors presumably will build its small car in Chevrolet facilities. Chevrolet was the division that started a small car program 10 years ago and is the likely one to carry through now. But during recent weeks, both Pontiac and Buick have been mentioned as the possible marketing agents for the small GM car.

Chevrolet has some 7500 dealers—a good organization to launch a new product. According to one report, Chevrolet is hoping to sell 500,000 small cars itself, and the large dealer organization could help Chevrolet accomplish this much easier than either Pontiac or Buick could.

Three plant locations have been mentioned for Chevrolet participation in the program—Van Nuys, Calif., Kansas City, Mo., and Willow Run, Mich. Expansion programs already have been undertaken at all three sites. The cross-country spread would aid in distribution and provide flexibility.

To keep launching costs to a minimum, Chevrolet is seriously considering overhead conveyors for its small car assembly. Such a set up would require less revision of existing assembly facilities.

### Allegheny Ludlum Develops Two High-Temperature Alloys

Allegheny Ludlum Steel Corp. announced the development of two new high-temperature alloys for use in jets and missiles.

Both alloys, designated D-979 and AF-71 were developed in the company's Research Laboratory at the Watervliet, N. Y., Works, and have been produced in billets, bars, sheet, wire, and forgings.

The company said Alloy D-979, a nickel-chromium based material, retains its strength at temperatures up to 1600 F. It is produced by the consumable electrode vacuum melting process pioneered by Allegheny Ludlum.

Alloy AF-71, developed by Allegheny Ludlum under an Air Force contract, is an iron-chromium manganese material which is reported to have outstanding creep-rupture properties in the 1000 to 1500 F range.

The company said both alloys are now available in experimental quantities on a developmental basis. However, commercial size heats up to 20,000 lb have been made under the company's research program.



Autocar's new truck series uses lightweight components

### Autocar Western States Truck Uses Aluminum to Save Weight

A new Autocar series, designed especially for use in the 11 Western states, uses aluminum, Fiberglass and other lightweight components to save up to 25 per cent in tractor weight.

The new "A" series of Diesel-powered vehicles uses aluminum in both functional and structural components. Even Fiberglass is introduced for fender construction.

The "A" series employs aluminum for the frame, transmission cases, clutch housing, steering gear housing, disk wheels, fuel tank, cab frame and skin. The frame is heat-treated aluminum with bolted construction.

Rear suspension on the A10264 6 x 4 tractor has aluminum beams and saddles.

Autocar developed multi-function aluminum brackets for various uses in the new construction. The location of the steering gear was changed so that certain parts could be eliminated, effecting additional weight economies.

GCW of the new trucks is 76,800

lb. Diesel engines range from 180 to 262 hp. Four, five and 10-speed transmissions are available.

### Chrysler Executive Stresses Role of Styling in Economy

Styling, despite current criticism from every quarter, is vital to the expanding economy of the country, according to Virgil M. Exner, vice-president and director of styling for Chrysler Corp.

Since the automobile industry fell into a sales slump this year, critics have popped up all around the country, and styling has been one of the chief butts of their criticism. "Chrome" and "fins" are two words that have been heard most frequently.

Exner, however, says that styling is an important factor in stimulating consumption. He told a meeting in Washington, D. C. that style is the "distinctive character that has been skillfully and deliberately created so that it is communicated to other persons."

### THREE-WHEEL LAMBRETTA

Latest addition to the Lambretta line of three-wheel commercial utility vehicles is this 150 FD-c model, which is equipped with removable cab roof and doors, and is capable of carrying loads of over 700 lb. An open pick-up type body is also available. Both models will be marketed through Lambretta's over 300 dealers through the country.



# News

## AUTOMOTIVE AND AVIATION



### MACK UNVEILS SHORT-LENGTH TRUCK TRACTOR

*This new Mack truck measures only 89 in. from front of bumper to back of cab and is said to be the shortest conventional tractor cab arrangement ever developed in this country. To reduce length, the B model contour cab was moved forward, allowing the engine to project slightly into the cab. Vehicle is available in two tractor models: the B-66 and B-67, powered by Mack's Thermodyne gasoline and Diesel engines, respectively.*

### GM, Ford Favor Labeling Bill, Chrysler Neither Pro Nor Con

General Motors and Ford have voiced approval of a proposed law that would require the labeling of new cars with the manufacturers' suggested retail delivered price. Chrysler, however, is neither for nor against the bill.

Spokesmen for the three auto firms testified recently before the Senate subcommittee on automobile marketing practices in Washington. The measure (Senate Bill 3500) is aimed at providing the customer with more information of a clearer nature on the price of the car.

GM's William F. Hufstader, vice-president in charge of distribution, told the Subcommittee that the law would help provide sounder business practices for the industry. He said the proposed bill would either eliminate price-packing or give the customer enough true information so he could determine how much of a "pack" is written into the retail price.

Ford's Walker A. Williams, vice-president in charge of the Dealer Policy Board at his company, said that the elimination of mal-practices in automobile marketing will contribute to the maintenance of a high volume of automobile sales.

Chrysler's Charles L. Jacobson, vice-president-dealer relations, told the group that his company is "neither opposed to the bill nor in support of it." He said that, in gen-

eral, legislation in this area is not necessary, but if the great majority of authorized new car dealers feel such a law would help the situation, "then we have no objection to it."

All three witnesses said they would like to see certain changes made in the original proposal, changes in wording which would not affect the general intent or aim of the bill.

### First Quarter Sales, Earnings For Big Three Drop Sharply

First quarter financial reports for all three of the major automobile producers showed sharp declines in sales and earnings from the levels of a year ago. The reports, however, were not unexpected. Sales and production rates for all of the Big Three have been running below the 1957 rates.

Studebaker-Packard's report was not released in April, but company president Harold E. Churchill indicated earlier that the S-P report would show an operating loss. Only American Motors was able to report an increase in business from the year-ago level.

Both General Motors and Ford Motor Company reported earnings below the 1957 first-quarter net, but Chrysler Corp. reported a loss of \$15.1 million during the quarter.

Here are details of the quarterly statements:

**Chrysler Corporation**—Sales totaled \$537,234,081, compared with



### NEW DIESEL TRACTOR FEATURES USE OF ALUMINUM

*New GMC Diesel highway tractor has aluminum construction features which give it a curb weight of only 10,450 lb, said to be the lightest in its class. Designated Model D860, the tractor is powered by a GM 6-71SE Diesel that develops 189 hp at 1800 rpm. It has a GVW of 30,000 lb and GCW of 60,000 lb. With optional engine (6-71SE) and axles it has ratings of 33,000 and 65,000 lb. Length from bumper to back-of-cab is only 90 in*



### SQIRMIN' IRMA

This seat cycle test machine was developed by Fisher Body engineers to test the wearing qualities of car seat fabrics and paddings. Nicknamed "Squirmin' Irma," the machine has two 150-lb saddles which rest on the seat and are "squirmed" 25,000 times. To test the springs, saddles are bounced up and down on the seats 65,000 times

\$1,150,723,712 in 1957. A net loss of \$15,139,802 for the period compared with earnings a year ago of \$6,545,521. Car and truck shipments totaled 185,888 units, compared with 420,880 units a year ago.

Missiles business amounted to \$55 million, or 10 per cent of total sales, compared with the 1957 figure of \$30 million, or 3 per cent of total sales.

Capital expenditures during the period amounted to \$12.3 million, compared with \$527.6 million a year ago.

**Ford Motor Company**—Sales for the first quarter totaled \$1,095,800,000 compared with \$1,569,500,000 in 1957, a decline of 30.2 per cent. Consolidated earnings were \$22.7 million compared with \$100.5 million last year. Car and truck factory sales dropped from 626,206 to 400,19, or 36.1 per cent.

**General Motors**—Net sales totaled \$2,721,000,000, down 11.6 per cent from \$3,077,000,000 a year ago. Earnings amounted to \$185 million compared with \$261 million a year ago. Vehicle shipments from U. S. plants totaled 780,941 units, compared with 944,078 a year ago. Overseas and Canadian plant shipment, however, increased from 152,647 a year ago to 201,022.

**American Motors**—The report covers the first six months of the fiscal year, which began last Oct. 1, and shows a profit of \$7,329,631 compared with a net loss of \$5,332,471 for the first half of 1957. Sales of \$227,363,805 were 20.2 per cent above the 1957 total of \$189,117,806.

# AAI TABLOID

A familiar but rarely used aluminum casting alloy containing more than 20 per cent silicon may be the ideal wear-resistant metal for an all-aluminum automobile engine, say research engineers of Aluminum Co. of America. Recently developed foundry techniques, plus improved cutting tools, have eased the job of casting and machining this super-hard alloy. Cylinder wall surfaces cast in the new material contain hard silicon crystals, separated by aluminum pockets, which act as tiny oil reservoirs.

Crucible Steel Co. of America developed a new tool steel called LaBelle HT, which is designed, the company says, for applications requiring high-resistance to shock or impact. Such applications include shear blades, impact extrusion tools, cold heading dies and punches, and coining and striking dies.

A gas turbine that weighs only 30 lb and delivers either 5 or 10 hp has been developed jointly by Lear, Inc., and Propulsion Research Corp. under a Defense Dept. contract. The new unit, called Turbo-Mite, can be used for auxiliary power, or as a portable pump, portable pneumatic source, or portable ground power.

Borg-Warner Industrial Cranes is the new name for the Industrial Crane & Hoists operation of Borg-Warner's Ingersoll Products Div.

A Standard Oil Co. (Indiana) scientist reports that it may be possible to control carbon's structure so that it can be tailored to perform many single specific separation jobs. Holes that form in the carbon sheet when it is activated furnish spaces for molecules of various shapes and sizes to rush in and thus be selectively removed from the original liquid or gas.

Armour Research Foundation reported a record volume of research and development contracts in the first half of its fiscal year. The total exceeded \$7 million—a 5 per cent increase over the same period last year.

Nuclear Corp. of America is now producing dysprosium metal in commercial quantities. The metal has a high neutron cross section (1100 barns), a relatively high melting point (1400 C), and paramagnetic properties. Possible applications are in the construction of nuclear reactors and as a magnetic alloy for use in electronic devices, the company says.

Ampco Metal, Inc., developed a new aluminum bronze alloy which contains 1/2 per cent of either tin or silver and is said to be highly resistant to stress corrosion cracking. Tests show, the company says, that finished fabrications do not need stress relief and that field changes, alterations, or repairs can be made without heat treatment.

Strom Steel Ball Co. moved its entire operation from Cicero, Ill., to a new modern plant in Erwin, Tenn.

Singer Manufacturing Co. formed a Military Products Div. to develop and produce electronic and electro-mechanical equipment for missiles and space ships.

Two of Britain's biggest aviation firms—Bristol Aeroplane Co. and Hawker Siddeley Group—are forming a new company to coordinate their aircraft engine activities. The new firm will be called Bristol-Siddeley Engines, Ltd., and will be operated on a "fifty-fifty" basis.

Mallory-Sharon Metals Corp. acquired Johnston & Funk Titanium Corp., a leading producer of titanium and zirconium wire and rod.

United States Steel Foundation, Inc., announced grants of \$2 million to 655 educational institutions, plus several educational associations and groups.

Armstrong Cork Co.'s Glass and Closure Div. announced a multi-million dollar expansion program involving plants at Dunkirk, Ind.; Millville, N. J.; Lancaster, Pa., and Keyport, N. J.

# AVIATION MANUFACTURING



## NEW CLARK TRACTOR TOWS B-52 JET BOMBER

*This new towing tractor built by Industrial Truck Div. of Clark Equipment Co. is designed to tow giant jet airliners soon to go into operation in this country. The new tractor, called Jetow, has a drawbar pull of up to 33,000 lb. Only five ft high, it features a unique braking system which permits individual rear wheel braking for tight turns.*

## Boeing Gets AF Contract For 130 More Jet Tankers

The Air Force awarded Boeing Airplane Co. a \$202,866,300 contract for 130 KC-135A jet tankers, bringing to 345 the number of aerial tankers on order.

The tankers will be produced at the company's Renton, Wash., plant, and production is scheduled to reach the peak rate of 15 per month by July of this year. The company said the new contract will carry production through the end of 1959.

The KC-135 is powered by four Pratt & Whitney J57 jet engines, each developing more than 10,000 lb thrust. Top speed is more than 600 mph and ceiling is above 35,000 ft.

The KC-135 can accommodate 80 passengers or 25 tons of cargo, or a combination of both. Aerial refueling tanks and equipment are located in the lower deck, leaving the upper deck free for cargo or personnel.

## NACA Says Research Balloon Can Be Propelled to Moon

Circling the moon with an inflatable satellite covered with aluminum foil is entirely feasible, Government scientists say.

A packaged satellite built to inflate

to a 100-ft diameter could be propelled to or around the moon. That's the view of the National Advisory Committee for Aeronautics, top Federal aviation research agency.

NACA Director Hugh Dryden recently told Congress the inflatable

device could be propelled into space to provide data about the moon, or to act as reflector for radio waves.

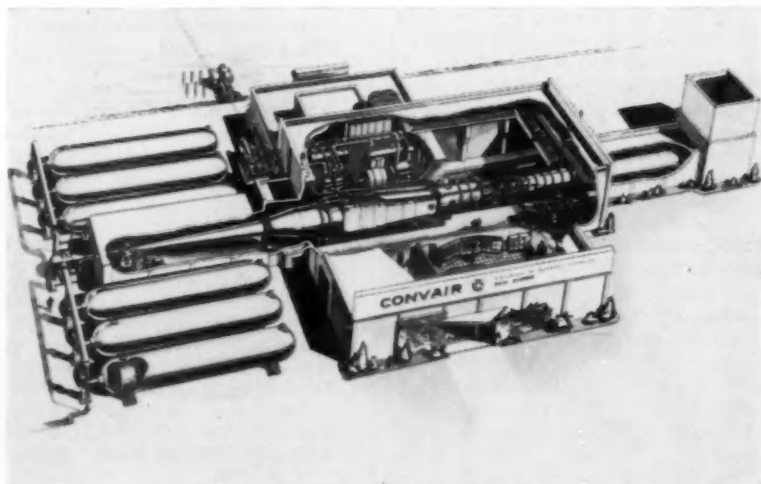
The 100-ft satellite is currently in the discussion stage. Estimates vary as to the time required to build and launch one successfully. Earlier this year, in testimony before a House Appropriations group, NACA suggested one might be put up "in the next two years."

Propulsion required to launch the research balloon to the vicinity of the moon would have to be extremely powerful, scientists say. A possible method would be to devise engines similar to those for intercontinental ballistic missiles, but there is no indication now that ICBM engines will be put to this use.

## Cessna 2nd Quarter Earnings Establish an All-Time High

Cessna Aircraft Co. earnings for the second quarter of the 1958 fiscal year reached an all-time high, according to Dwane L. Wallace, president.

Net income for the second quarter, he reported, totaled \$1,585,719, compared with \$852,298 last year, a gain



## CONVAIR UNVEILS NEW 3700-MPH WIND TUNNEL

*Drawing shows major components of new 3700-mph wind tunnel built by Convaire Div. at San Diego, Calif. Six cylindrical tanks at left store air with a total volume of 28,000 cu ft at pressure of 600 psi. Airflow is controlled by 24-in. valve at left end of tunnel. Test section of model is behind control room (in front unit). Air is exhausted through sound suppression chamber and concrete stack at far right. Power room with its 8000-hp motor is behind main section of tunnel.*

of 86 per cent. Sales for the three months ending March 31 amounted to \$23,656,000, compared with \$17,234,000 for the like period a year ago.

Total sales for the first six months of the fiscal year climbed to \$44,428,000, up 37 per cent over sales of \$32,237,000 for the same period in 1957.

Wallace said that military sales for the six month period were excellent, and he attributed the increased volume to higher deliveries of the T-37A twin-jet trainer and Boeing B-52 stabilizer assemblies. Military backlog on March 31 amounted to \$52 million, he reported.

Wallace estimated that sales for the 1958 fiscal year would exceed \$80 million and earnings for the year would top the record high established in 1956.

### **Aerojet Gets Research Award For Solid Rocket Power Plant**

The Air Force awarded Aerojet-General Corp. a \$1.5 million contract for development work on a solid propellant rocket for ballistic missiles of intercontinental range.

The company said work under the contract will be carried out at Aerojet's Solid Rocket Plant, at Sacramento, Calif.

Aerojet, a subsidiary of General Tire and Rubber Co., is also working on rocket engines for Navy Regulus I and II missiles, the Army Hawk, the AF Bomarc, and others.

### **Republic Sales, Earnings Show Sharp Drop in First Quarter**

Republic Aviation Corp. reported sales for the first quarter of 1958 totaled \$85,831,275, compared with sales of \$76,845,222 for the same period a year ago.

Net income was \$702,029, compared with \$1,776,738 for the same period last year.

The company attributed the sharp drop in sales and earnings to model changeover and stretchouts on Government orders.

Mundy I. Peale, president, told Republic stockholders the company has a \$347 million backlog in orders for the F-105 fighter-bomber, and that an additional \$300 million in orders for F-105's and parts is now under negotiation with the Air Force.

### **Thompson Products Announces Broad Company Reorganization**

Thompson Products, Inc. announced it is regrouping several divisions to meet changing defense needs and ex-



### **PRODUCTION WF-2 TRACER MAKES FIRST FLIGHT**

First production model of the Grumman WF-2 Tracer, the Navy early warning plane, is shown on its first flight. The plane's huge radome houses long-range detecting equipment. Grumman was awarded a Navy contract last year for "over \$40 million" to produce the Tractor.



### **GRUMMAN TO MARKET AGRICULTURAL BIPLANE**

The Ag-Cat, a new biplane designed by Grumman Aircraft as a crop-duster and sprayer, will be powered by any one of more than half-dozen engines in the 200-300 hp class. The plane has an overall length of 24 ft. 8 in; gross weight, 3600 lb; and empty weight, 2179 lb. Hopper volume is 29 cu ft (217 gal) and hopper load restriction, 1000 lb. Maximum speed in level flight is 110 mph and stall speed is 42 mph.

pand the company's activities in the systems field.

The reorganization includes the formation of a new group, called the Tapco Group, under the direction of vice-president Edward P. Riley, who headed the Accessories, Pneumatics and Hydraulics Div.

The new Tapco Group includes the present Jet, Accessories and Pneumatics Divs., the aircraft operations of the West Coast Div., and the Cleveland operations of the Electronics Div.

Other moves in the broad company

reorganization include the forming of a Customer Requirements Group, under staff vice-presidents Ben W. Chidlaw, G. R. Moore, and Len W. Reeves; joining the Hydraulics Product Div. with the Michigan Div., both under the direction of vice-president Charles W. Ohly; and joining some former units of the electronics Div. in a new Consumer Products Group, under the direction of William M. Jones.

President J. D. Wright, in announcing the changes, said they represent (Turn to page 43, please)

# MIEN

## IN THE NEWS



*Midland-Ross Corp., Owosso Div. — J. L. Adams has been appointed director of sales.*

**Willys Motors, Inc.**—**Paul J. Steil** has been elected vice-president and manager of domestic marketing operations; **C. W. Moss**, vice-president and general sales manager of the Willys Sales Corp.; and **Dean B. Hammond**, vice-president in charge of engineering.

**E. I. du Pont de Nemours & Co., Inc.**—**Walter J. Beadle** has retired as a vice-president and member of the executive committee; and **George E. Holbrook** has become a vice-president and member of the executive committee.

**Surface Combustion Corp.**—**E. W. Weaver** has been named staff assistant to the vice-president, engineering; **Don Beggs**, manager of engineering, Furnace Divs.; **O. E. Cullen**, manager of Research and Development Dept.; **J. Montagino**, chief engineer, Special Heat Treat Div.

**Vickers, Inc.**—**Edward I. Brown** was named director of engineering for the Machinery Hydraulics Div.

**Chrysler Corp.**—**Charles W. Snider** has been named director of government relations for the Defense Operations Div.

**Ford Motor Co.**—**J. Franklin Mellem** was appointed styling administration and planning manager.

**American Motors Corp.**—**Malcolm R. Lovell, Jr.**, was made manager of industrial relations research and analysis.



*Lindberg Industrial Corp. — Robert O. Offill was named advisory engineer.*



*Wagner Electric Corp.—G. W. Brown has been elected executive vice-president, and Paul C. Ford was named vice-president in charge of engineering and research.*

**Clark Equipment Co., Transmission Div.**—**Malcolm G. House** has been appointed industrial relations manager.

**Controls Co. of America**—**Charles M. Stainton** was appointed vice-president and director of marketing.

**Chevrolet Motor Div., General Motors Corp.**—**Harold Andersen** has been appointed an assistant manager of the Chevrolet truck department.

**Thor Power Tool Co.**—**William F. Fowler, Jr.**, has been appointed manager of branch operations.

**B. F. Goodrich Tire Co.**—**Edward M. Bader** has been named division manager of quality control, succeeding **Leonard M. Freeman**, retired; and **Fred C. Halliburton** was made manager of wage and salary administration.

**Chrysler Corp., Export Div.**—**Robert J. Burnand** has been appointed manager-fleet sales.

**Olin Mathieson Chemical Corp., Aluminum Div.**—**Charles B. Brown** was appointed manager, transportation industry sales, and **Harry M. Walton, Jr.**, was named Baltimore branch sales manager.

**Texas Instruments, Inc.**—**Richard A. Arnett** was made marketing manager of the Industrial Instrumentation Div.

**E. C. Watkins & Co.**—**John E. Puvogel**, **Robert I. Cratch**, and **John M. Thomas** were appointed vice-presidents in charge of manufacturing, marketing, and new product planning and development, respectively.



*Burroughs Corp. — Ray R. Eppert was elected president to succeed John S. Coleman.*

**George L. Nankervis Co.**—**C. James Civan** was appointed manager, and **Angelo Giaier** chief engineer of the Metal Finishing Systems Div.

**Allis-Chalmers Mfg. Co., Harvey Works**—**Alexander Dreisin** has become chief engineer of the Diesel Fuel Systems Dept.

**AC Spark Plug Div., General Motors Corp.**—**Allison E. Gossett** was made assistant director of aviation sales.

**Eaton Mfg. Co., Axle Div.**—**Henry Newhouse** has been promoted to assistant sales manager.

**Borg-Warner Corp., Spring Axle Div.**—**Arthur J. Welch** has been appointed vice-president and general manager.

**Hoover Ball & Bearing Co.**—**Marvin L. Walsh** has been named assistant advertising manager.

**Standard Products Co.**—**Wilber C. Nordstrom** was elected vice-president-manufacturing.

**Gould-National Batteries, Inc.**—**Harold E. Zahn** has been named vice-president in charge of engineering and research.

**General Tire & Rubber Co.**—**William L. Sheehan** was appointed director of sales for semi-rigid vinyl sheeting for vinyl-to-metal applications.

**White Motor Co., Reo Div.**—**George R. Collins** was named general sales manager.



*Goodyear Tire & Rubber Co. — Victor Holt, Jr., was elected executive vice-president.*



**Stewart Warner**  
Corp., Electronics Div.—**Roger W. Burtness**  
has been named manager of engineering and research.

**Flexonics Corp.**—**Howard W. Griesbach** has been appointed vice-president in charge of operations.

**Sun Electric Corp.**—**R. A. Bland** was named vice-president-general sales manager, Automotive Div.

**Stephens-Adamson Mfg. Co.**—**Elmer J. Renner** was made vice-president in charge of engineering.

**Boeing Airplane Co.**, Pilotless Aircraft Div.—**Robert H. Jewett** has been named assistant general manager-chief engineer.

**Torq Engineered Products, Inc.**—**L. C. Schaefer** has become vice-president in charge of engineering.

**Bendix Aviation Corp.**, Eclipse Machine Div.—**Robert K. Gornall** has been promoted to sales manager of carburetors and **John A. Riopelle** has been promoted to sales manager of fuel nozzles.

**Yale & Towne Mfg. Co.**—**Elmer F. Franz** and **John A. Baldinger** were elected vice-presidents.

**General Motors Corp.**, Delco-Remy Div.—**John D. Baker** was appointed assistant general sales manager responsible for the planning and direction of original equipment sales activities; **Dan T. Fisher**, assistant general sales manager responsible for all replacement and after-market sales and service; **Forrest A. Stinson**, manager of Detroit regional sales; **Frank R. Hubler**, manager of Anderson regional sales; and **Darwin E. Pearson**, manager, Central Sales Office.

**Ford Motor Co.**, Tractor & Implement Div.—**Donald W. Sawyer** has been made assistant general sales manager in charge of field operations.

**Philips Electronics, Inc.**—**Arie Vernes** was elected president.



**Huck Mfg. Co.**—**Ray V. Clute** has been appointed western division sales manager.

**Minneapolis-Moline Co.**—**William A. Norlander** has been promoted to chief engineer—automotive and industrial research.

**Control Systems Co.**, Div. of Hancock Industries—**Carl S. Saltzman** was named manager.

**Gulf Research & Development Co.**—**C. W. Butler** has been named director of the Automotive Engineering Div.

**Beckman & Whitley, Inc.**—**Howard Thomas Orville** was appointed vice-president.

**Wall Colmonoy Corp.**—**Elmer J. Lell** has been appointed vice-president in charge of Colmonoy Div. operations.

**Four Wheel Drive Auto Co.**—**Robert A. Olen** has been elected vice-chairman of the board, and **Maurice E. Ash** has been elected president.

**Gunito Foundries Corp.**—**Gerald E. Doherty** has been named assistant sales manager of the Automotive Div.; **William H. Shinn**, assistant to the president; **Thomas D. Schmidt**, sales manager of distributor products; and **S. A. Malthaner**, director of engineering for all company products.

**Republic Aviation Corp.**—**William E. Cobey** has been appointed director of helicopter engineering.

**Budd Co.**—**Herbert A. Boas, Jr.** has been appointed director of marketing.

**M-E-L Div.**, Ford Motor Co.—**C. B. Pfeiffer** has been appointed Mercury planning manager; **R. E. Kimball**, Edsel planning manager; **J. R. Hallock**, Continental and Lincoln planning manager; **R. E. Donley**, product program coordinator; and **J. R. Gillette**, coordinator of new product feature development for all three car lines.

**AC Spark Plug Div.**, General Motors Corp.—**George R. Work** was named Detroit regional manager of replacement products; **J. Patrick Kane**, director of specialized marketing; **W. J. Oldfield**, director of advertising and sales promotion; and **John R. Church**, director of merchandising and aviation sales.

**Buick-Oldsmobile-Pontiac Assembly Div.**, General Motors Corp.—**James D. FitzGerald** was made staff assistant of waste control and purchasing.

**Joseph T. Ryerson & Son, Inc.**—**A. Philip Brendel** was named manager of reinforcing products sales at the Pittsburgh steel service plant, and **Paul J. Fountain** has become assistant manager of stainless steel sales for the Boston steel service plant.



**Olin Mathieson**  
Chemical Corp.—**Henry E. Gude** was made vice-president for manufacturing of the Aluminum Div.

**Borg-Warner Corp.**, Ingersoll Kalamazoo Div.—**A. M. Klinger** has been named sales manager of materials handling products.

**Minneapolis-Moline Co.**—**Roger R. Hipwell** has been named manager of advertising and sales promotion.

**Hartford Machine Screw Co.**—**Robert W. Grady** was named standard products sales manager.

**Bendix Aviation**, Scintilla Div.—**Donald B. Morse** has been appointed to director of sales, service, and advertising; **Donald L. Quinney**, sales manager; **Leonard D. Williams**, manager of sales office administration; and **William L. Bowler, Jr.**, new products manager.

**Conoflow Corp.**—**M. Mark Watkins** was appointed president and **John C. Koch** executive vice-president.

**U. S. Rubber Co.**—**Leland M. White** has been appointed director of research and development.

**Handy & Harman**—**M. W. Townsend** has been elected vice-president for administration and finance.

### Necrology

**Frank H. Adams**, 72, president of Surface Combustion Corp., died Apr. 6.

**Osborn H. Cilley**, 75, a vice-president and director of Raybestos-Manhattan, Inc., died Apr. 15, at Lancaster, Pa.

**E. Channing Coolidge**, 80, chairman of the board of Croname, Inc., died Apr. 15, at Highland Park, Ill.

**Walter Ferris**, 90, vice-president of Oilgear Co., died Apr. 16.

**George P. Howard, Jr.**, 58, district manager of White Motor Co. in Atlanta, Ga., died Apr. 20.

**George V. Slottman**, 54, vice-president of research and engineering of Air Reduction Co., died Apr. 21, at New York, N. Y.

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## **BLEND WITH ENJAY PARATONE®**

(VISCOSITY-INDEX IMPROVERS)

Base stocks blended with Enjay Paratone can be compounded into lubricants combining cold-weather quick starting properties with high temperature, low consumption characteristics. These lubricants are *all-season* oils, featuring improved gas mileage. More and more refiners and blenders are relying exclusively on Paratone to produce the high "VI" required in these all-season oils.

Through years of intensive research and development work with automotive manufacturers, Enjay has developed the only *complete line* of high quality additives (Paramins®) that can assure *maximum* performance characteristics. Why not let this experience and know-how work for *you*? Write, wire or phone the Enjay Company.

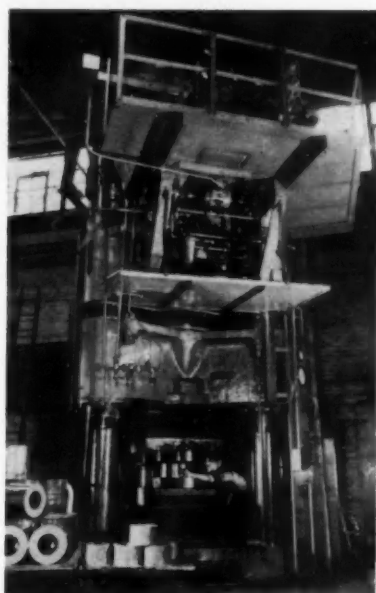
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Petrochemicals*





### POWDER METAL PRESS

Powder metal press installed at Chrysler's Amplex Div. plant in Detroit is capable of exerting six million pounds of pressure, the company says. The huge press is more than three stories high and weighs 125 tons. It can produce powder metal parts up to 30 in. in diameter.

Continued from Page 39

resent "an aggressive marshaling of of the company's engineering and sales know-how to meet most effectively the challenge of the new technologies and the rapid and continuing changes in the aircraft, missile, and space markets."

### Hertz Rent-A-Plane Service To Start in 56 U.S. Cities

Hertz Corp. announced it will begin a rent-a-plane service in 56 U. S. cities this month.

Licenses of Hertz Rent-A-Plane System, Inc., a new wholly owned subsidiary, will rent planes to individuals or groups with the pilot provided, or to qualified pilots.

Joseph J. Stedem, Hertz executive vice-president, said the company expects to extend the plane rental service to a total of 100 cities by the end of the year. He estimated annual vol-

ume for the new subsidiary at \$4 million for the first year of operation.

### Pesco Products Forms New Warehousing Branch

Pesco Products Div. of Borg-Warner Corp. announced the formation of a new branch that will design, build, and install reserve storage warehouse systems for semi-automatic or fully automatic operation.

R. A. Powley, division president, said the new operation—known as Automatic Warehousing Branch—will produce conveyORIZED production-line systems and a complete line of tooling for service and overhaul of jet engines. It will also build and install custom material handling equipment.

D. Wayne Zimmerman, former assistant manager of Ford Motor Co.'s largest manufacturing engineering department, heads the new operation as branch manager.

### Allis-Chalmers Tests Crawler Powered by Gas Turbine Engine

Allis-Chalmers is working with an experimental crawler tractor powered by a gas turbine engine. The test model, designated the P-91, is equipped with a Boeing 502-10C high-speed gas turbine engine.

The company is testing and evaluating the ability of the turbine to deliver the range of speed and flexibility of power required for crawlers. Net horsepower developed by the tur-

bine is equal to the output of its diesel counterpart in Allis-Chalmers' big HD-21, according to the company. Externally, there is little difference in the appearance of the P-91, although the noise is different in pitch and character.

### 'You Auto Buy' Campaigns Are Successful as Sales Stimulant

A recession-prompted sales gimmick that started in Cleveland and spread to some 250 other cities across the nation has been tabbed successful in nearly every quarter. It's the "You Auto Buy" campaign—generally nothing more than good old-fashioned "hard sell" with plenty of promotion, advertising, demonstrations, and personal contacts.

Results from around the country indicate the success of various local campaigns, sponsored by dealer organizations: Detroit, 48 per cent sales increase in the first 15 days of the campaign; Chicago, \$50 million volume in the first nine days and a 74 per cent increase in new car sales plus an 80 per cent jump in used car sales; Houston, 65 per cent increase; Baton Rouge, 30 per cent over the previous 10-day period; Peoria, 40-50 per cent increase; Davenport, 80 per cent increase in both new and used.

A slight upturn in sales was noted in the second 10-day period of April, when the daily selling rate went over 14,000 cars, or about 6 per cent higher than the previous 10 days. But the selling rate was well below the 20,000 rate of a year ago.

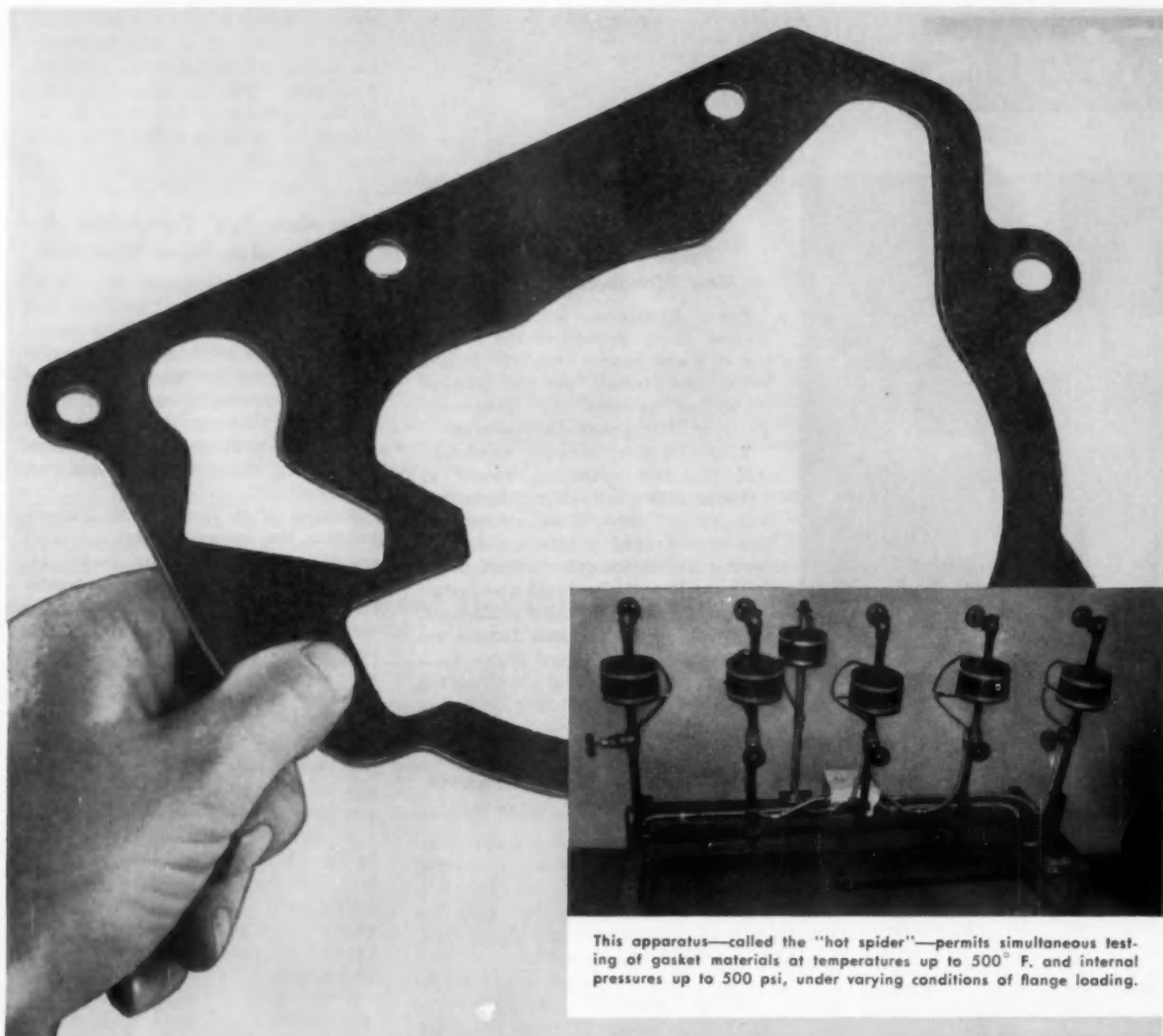
Field stocks are expected to fall by approximately 15,000 a week during the remainder of the production year,

(Turn to page 94, please)



### ALLIS-CHALMERS TESTS GAS TURBINE TRACTOR

Allis-Chalmers experimental P-91 gas turbine crawler tractor is put through its paces at the company's proving ground in Springfield, Ill. The research model, powered by a Boeing 502-10C gas turbine power unit, was assembled at Allis-Chalmers' Springfield Works.



This apparatus—called the "hot spider"—permits simultaneous testing of gasket materials at temperatures up to 500° F. and internal pressures up to 500 psi, under varying conditions of flange loading.

## Accopac gaskets maintain bolt torque, seal automatic transmissions perfectly

In today's automatic transmissions, the combined effects of elevated temperature and high internal pressure often cause leakage at gasketed joints.

To meet these difficult sealing requirements, new Armstrong Accopac gasket materials have been developed. They seal transmissions perfectly under combinations of heat and pressure that can cause extrusion and excessive bolt-torque loss with conventional materials.

The new Accopac materials are pre-compressed, high-density sheets made by a beater-saturation process pioneered and patented by Armstrong. Sheets made in this way are tough, flexible, and crush resistant.

These Accopac compounds are recommended for a wide range of heavy-duty applications. Where temperatures above 300° F. are involved, Accopac asbestos-

fiber sheets are recommended. For temperatures up to 300° F., new cellulose-fiber stocks are available.

The new compositions can be used as economical replacements for conventional sheet asbestos or other more expensive materials. In many cases, the Accopac materials make possible substantial savings.

Armstrong Accopac is available in rolls, sheets, ribbons, and die-cut parts. For more information about these versatile new compositions, write for a copy of our new Accopac folder. Address Armstrong Cork Co., Industrial Division, 7005 Imperial Ave., Lancaster, Pa.

**Armstrong ACCOPAC**

... used wherever performance counts

automation at its best!! as only **BAUSH** can do it --  
with Baush completely mechanical/ transfer machines using "S"-Type Leadscrew Units ...

**TO GIVE YOU:**

Easy, economical maintenance with shop mechanics ...

Interchangeability of units ...

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No costly hydraulic leaks ...

Positive, steady tool feed ...

No surge or tool breakage in break-thru ...

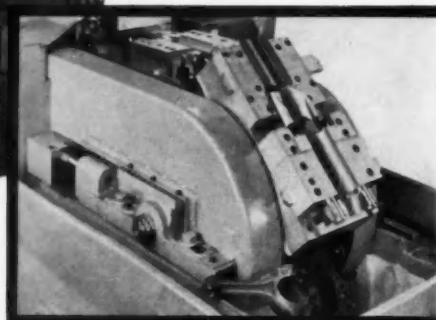
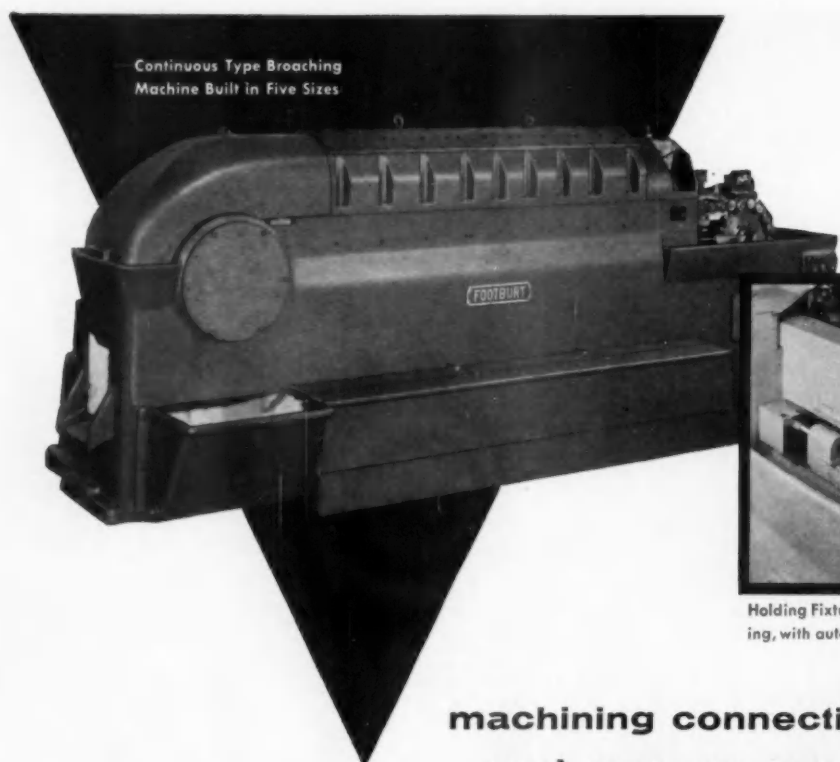
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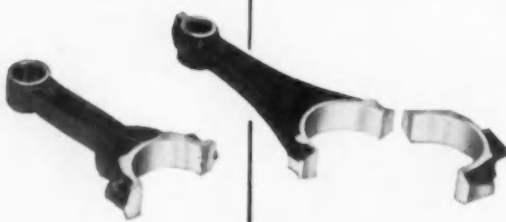
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## **S**urface broaching



Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

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A start button, a stop button, an indicating light—all in one handsome, compact selector unit.

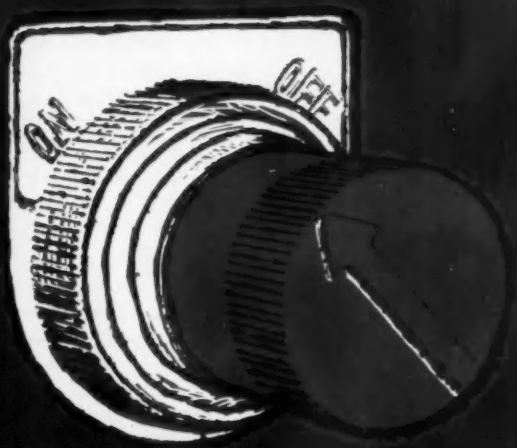
*Saves up to 60% on panel space!*

*Saves considerable initial expense!*

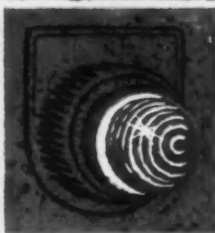
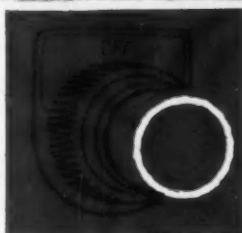
They're oil-tight, of course—with a panel-enhancing chrome finish—a lifetime operation snap-acting switch—and interchangeable nameplates for on-off, start-stop, forward-reverse. Or any combination you choose.

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REPLACES THIS . . . AND THIS . . . AND THIS



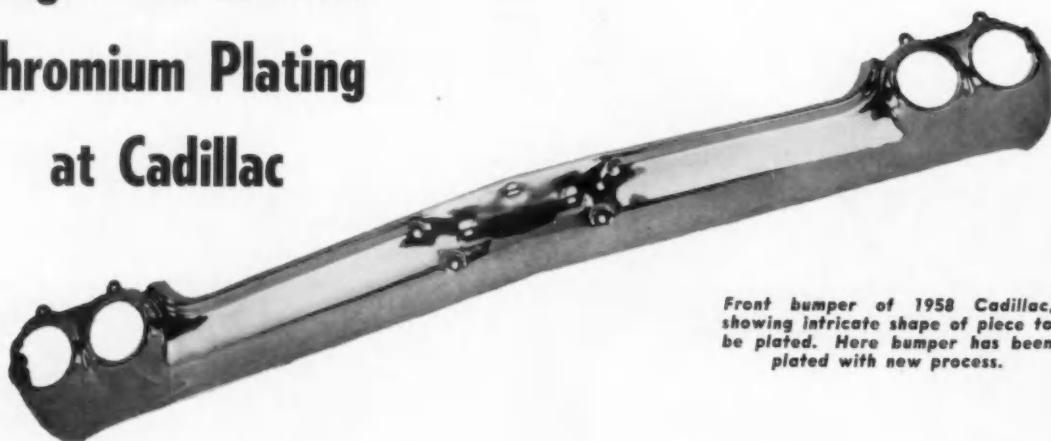
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STANDARD CONTROL DIVISION  
Beaver, Pennsylvania



J-30296

# Bright Crack-Free Chromium Plating at Cadillac



*Front bumper of 1958 Cadillac, showing intricate shape of piece to be plated. Here bumper has been plated with new process.*

**By H. Mahlstedt**

Product Manager, Plating Products  
Metal & Thermit Corp.

**C**ADILLAC Motor Car Div. of the General Motors Corp. for the past eight months has been using a recently developed bright crack-free chromium plating on the bumpers and bumper extensions of its cars. The process has proved itself superior to any other chromium plating previously used by Cadillac.

## **Usual Presence of Cracks**

Tests carried out at Cadillac have indicated that the new chromium plating has greatly improved corrosion resistance over plating used previously, apparently because of the absence of the minute cracks formerly found in all chromium plating.

The presence of cracks, recognized throughout the plating industry and in the automobile field, has been an inherent property of deposits of more than 0.000010 in. which is the range of thickness of the usual decorative chromium used over nickel. This has been true ever since the industry first

started using chromium plating on bumpers and trim for its cars since its inception. These cracks were accepted simply because there was no way of plating substantial thicknesses without getting them.

Presence of the cracks in chromium plating has been the cause of much trouble in the past. Since the deposit was not continuous, corrosive materials entered the cracks and attacked the undercoating. In most cases, it was believed that the cracking of the chromium deposit also set up stresses in the undercoatings of copper and nickel, causing them to crack along the same lines taken by the cracks in the chromium. This permitted any corrosive materials to attack the basis metal.

## **Factors Causing Cracks**

Corrosive materials most frequently found to attack automobiles are the chlorides used on streets to melt snow and ice, mud consisting of acid soil and water, and in industrial areas the soot and fumes given off by factories. Along the sea coasts, salt air and blown spray also have been found to be extremely corrosive.

The acids picked up from the road and atmosphere entering the

crevices in the deposits from the electrolyte when the different metals set up an electrolytic potential and cause corrosion. If there were no electrolyte or no openings there would be no corrosion. Chromium, being a passive metal, acts as a cathode, while the other metals, being less noble, act as the opposite potential. These products of corrosion, being more voluminous than the electrolyte, wedge open the pores and the cracks where the action is taking place, allowing still more of the base metal to be exposed for still further action.

The result was severe pitting and rusting, especially in areas where the plating of both the undercoats and the chromium were thinnest. Efforts to use thicker deposits simply meant that the cracks would become more pronounced, and, hence, permit corrosion just the same.

Another factor believed responsible for the deterioration of the chromium finish was the unequal coefficients of expansion, where changes in temperature brought about widening and narrowing of the cracks in the ordinary bright chromium, hastening the breakdown of the depositions.

These factors had been accepted by the industry as being inherent

in chromium plating all along, until about five years ago, when one plating supplies manufacturer, Metal & Thermit Corp., introduced a crack-free chromium plating. This deposit, although it was apparently entirely free of the breaks in the finish, was plated with a matte or satin finish. However, it was the first breakthrough in the battle to obtain a chromium deposit without the cracks in the surface.

### Bright Finish Plating

Further development by the same company resulted in the development of a method of depositing crack-free chromium with a satisfactory bright finish. The technique was discussed briefly in an article entitled "New Plating Methods Offer Improved Decorative Parts," appearing in the Dec. 1, 1957 issue of *AUTOMOTIVE INDUSTRIES*.

When this development was brought to the attention of the technical staff of the Polishing and Plating Div. of Cadillac, tests were made to ascertain whether or not the plating was really crack-free and if so, what corrosion resistance the deposit had.

Using an accelerated acetic acid salt spray test devised by the division, technicians ran a series of checks on the new material. Results indicated that the bright crack-free chromium plating had corrosion resistance vastly superior to that of the plating then in use.

In May of 1957, Cadillac converted a hand tank to the new process for experimental use. After the usual adjustments necessary in any new method had been made, it was found that the new deposit performed decidedly better than the ordinary chromium plating.

In June 1957, the first automatic tank was converted to bright crack-free plating. It has been in production use ever since. A third tank will be converted to the new plating method in the near future. At the present time, Cadillac is plating about 40,000 parts a day

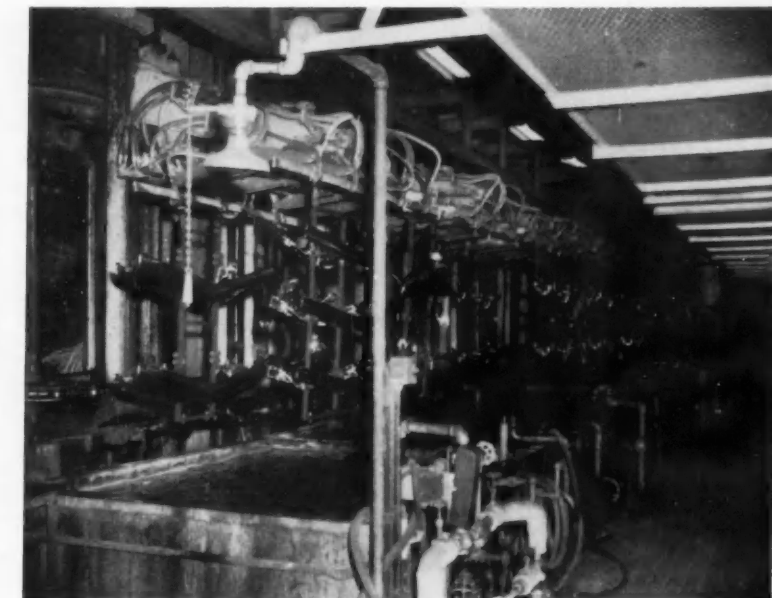


Photo courtesy of Cadillac Motor Car Div.

**Bumper parts in cleaning line before entering plating baths. Process is automatic.**

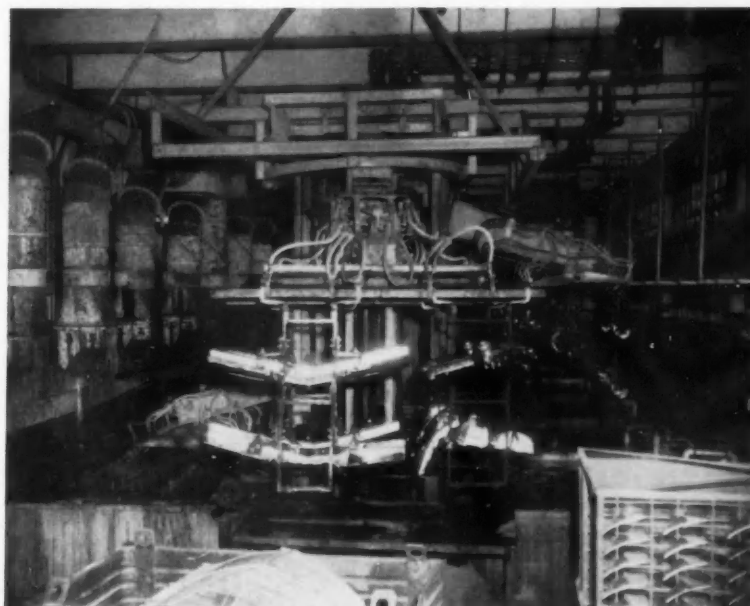


Photo courtesy of Cadillac Motor Car Div.

**Bumper parts move from cleaning to bright crack-free chromium plating solution for plating.**

with the new bright crack-free chromium plating process.

### Heavier Deposits

Although the supplier has found that it is feasible to plate in thicknesses up to 0.000100 in. with no

difficulty, Cadillac is using deposits of 0.000035 to 0.000040 in. because of limitations in the present equipment until further equipment on order is installed.

Future plans call for changes in the equipment to permit Cadillac

lac to plate to greater thicknesses. This can be achieved by either lengthening the time of the plating cycle or increasing the current. The first calls for additional plating equipment to permit maintaining the current output of parts, and the second calls for new current equipment.

At the present time, the base metal being plated is steel. Undercoats of approximately 0.001 in. each of copper and nickel are deposited before the part goes to the chromium bath. Specifications call for a minimum of 0.0007 in. of nickel on each part.

#### **Advantages of Process**

Cadillac's experience with the bright crack-free chromium plating has shown a number of advantages besides the absence of cracks, although that is, of course, the main reason for its use.

It has been found that the plate can be deposited on bright stainless steel as well as on other bright surfaces. Fewer rejects have been experienced since installation of the bright crack-free bath, which helps to offset the slightly higher cost of the bath.

Another advantage is that the new bright crack-free chromium process is easier to operate than was the bath for the ordinary chromium plating. It activates the nickel well. The throwing and covering powers of the bath are far superior, particularly in recessed areas of the parts, where ordinary chromium plate was not deposited to the thickness desired.

Still another advantage is the fact that the bright crack-free chromium can be replated, if necessary, without stripping, something which was not possible with the ordinary chromium plating.

The new bath is self-regulating, and hence requires less supervision and down time than did the older bath.

But certainly the most important factors are the quality of the plate, the versatility of the bath, and the absence of difficulties during the months that the new bath has been in operation.

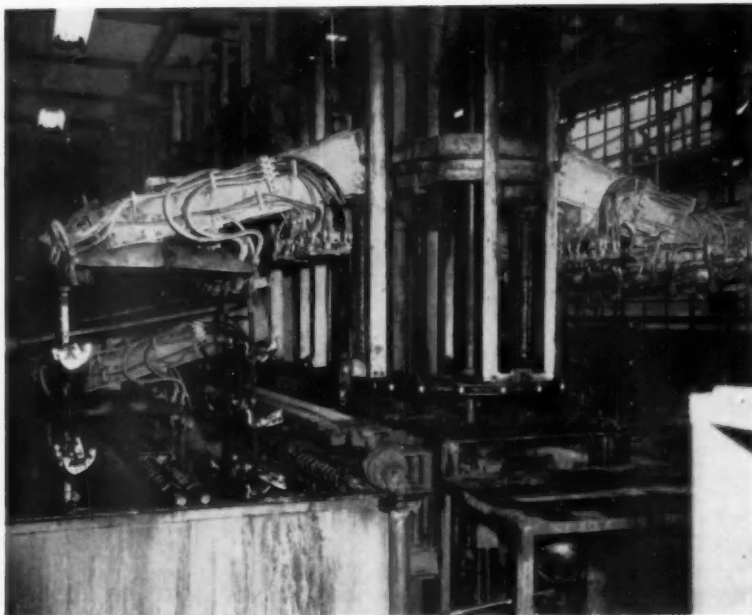


Photo courtesy of Cadillac Motor Car Div.

**Bumper parts enter the plating bath where they will receive bright crack-free chromium deposit.**

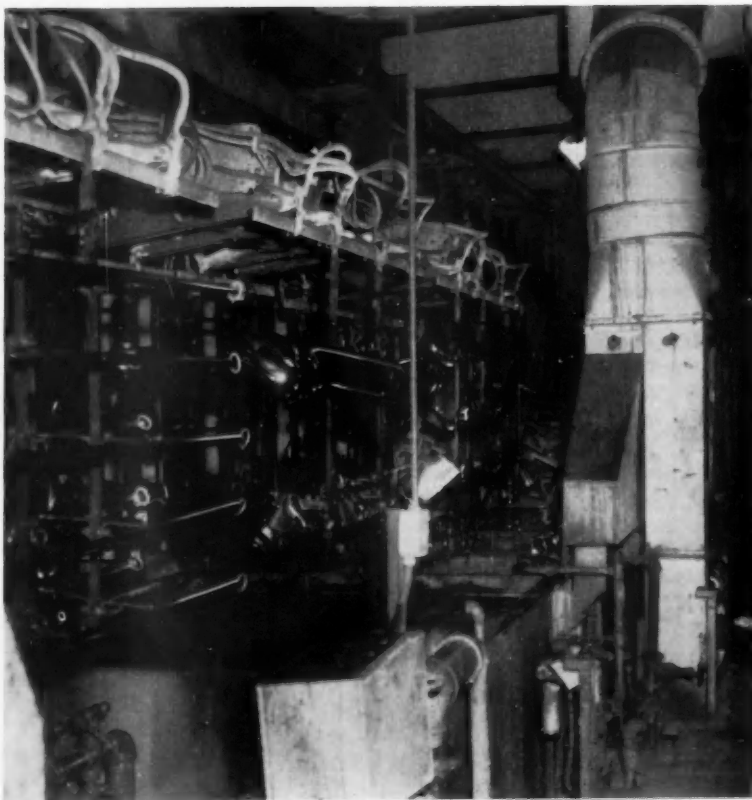


Photo courtesy of Cadillac Motor Car Div.

**Parts plated with bright crack-free chromium plating are rinsed and air-dried before being transported to assembly line.**

# New Method for Producing Turbine Wheels

**T**HE automotive gas turbine has been brought closer to reality by a revolutionary method of producing turbine and compressor rotors for jet engines and gas turbines, developed recently by the Engineering Research Office of Ford Motor Co. Patents have been applied for by Ford to cover this new technique and a license agreement has been effected with the Steel Improvement and Forge Co. of Cleveland which has worked co-operatively on the project.

Steel Improvement already is negotiating contracts for producing wheels for small gas turbines, for marine gas turbines, for missile applications, and for a wide variety of military applications.

Briefly stated, the technique employs the principle of hot extrusion forging. First the system of blading is positioned by means of an outer ring and an inner die. After the blades have been properly aligned and indexed, the space within the outer ring is filled with molten Kirksite. When the Kirksite has solidified, the inner die is removed and replaced by a hot billet. The billet then is extruded under suitable pressure, moving the plastic metal under and around the blade roots to effect a secure and completely filled mechanical bond. There is no metallurgical bond.

The extrusion cycle takes place in only a fraction of a second. Only relatively minor machining is necessary to remove excess metal from the wheel. It is found that the natural grain flow inherent in the

forging process provides a secure and high-load-carrying bond, free from stress concentrations. Another advantage of the forging method is in its high density structure, free from voids.

The principal objective of the research program involved in this development was to find positive means of drastically reducing manufacturing cost. On experimental engine projects Ford has paid as much as \$9000 for a single 9-in. wheel machined from a solid blank. Production wheels are said to range anywhere from \$500 for a wheel of limited application up to more than \$20,000 each. Similarly, vanes and buckets vary in complexity and cost because of the expense of machining the root to extremely fine tolerances.

In contrast, Steel Improvement and Forge advises it is negotiating contracts currently to produce 6-in. and 9-in. axial turbine wheels at less than \$100 each, plus the cost of blades.

It is a distinctive feature of the

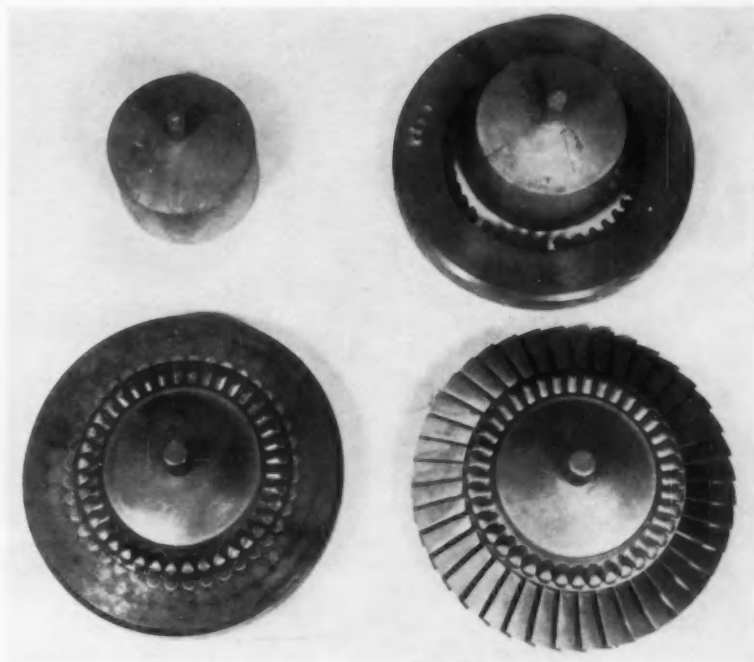
new process that no machining of the wheel is necessary for holding the blading, nor is it necessary any longer to machine the root of the blade or bucket. Blading can be produced by any commercial means—precision casting, forging, stamping, etc. And the root can be made with any desired configuration and used without further machining.

This is then a truly chipless process in which the size and weight of the forging billet produce the finished wheel without loss of costly material.

Another major feature of the extrusion process lies in the ability of producing integral stub shaft or hub extensions on the wheel. Depending upon the size of the extension, a preliminary extrusion is performed on the billet before making the final extrusion.

Although the project announced here is but one phase of the development work being carried on at Ford, it is of interest to learn that Ford is working with new gas tur-

(Turn to page 163, please)



*Illustrations show four steps in the new method for producing finished turbine wheels. At top left is the billet that is heated and extruded over and around blade roots to form the wheel hub; top right, blades sealed in Kirksite after having been positioned and indexed; lower left, the completed wheel with the billet extruded around the blade roots and, lower right, the wheel with Kirksite removed from between the airfoil blades prior to face machining to remove excess wheel hub metal.*

# Turning Transmission Parts on Tracer Lathes

By **ROBERT KENNEDY**  
Chief Tool Engineer

TRANSMISSION DIVISION,  
CLARK EQUIPMENT CO.  
Jackson, Mich.

**S**TEM pinions are among numerous transmission components produced by Clark Equipment Co. at its Jackson, Mich., plant.

Until recently, most of the operations on these forgings were performed in fairly conventional setups on older automatic lathes. These yielded good results but proved much slower and required considerably more skilled labor and more cutting tools than are needed

to turn the same forgings on Fisher type New Britain tracer lathes.

Before going to the Fisher lathes, the forgings have both ends faced off and are center drilled to fit between centers and into the driving chuck of the lathes. In the first of these, Fig. 1, the stem, which includes five steps, first is roughed with the singlepoint carbide tool controlled by the first of two templates. Then, the second template is brought into play, by rocking the template holder, and the finishing cut is made by the same tool, the spindle speed being increased and a finer feed used.

Average time for these two cuts is about 90 sec, loading and unloading included, and one man tends two machines. In the second Fisher lathe, Figs. 2, 3 and 4, the head or pinion end is machined, again using two templates, one for roughing and one for finishing cuts. In this machine, the setup is such as to hold nearly constant surface speed during each cut by varying the spindle speed suitably in rela-

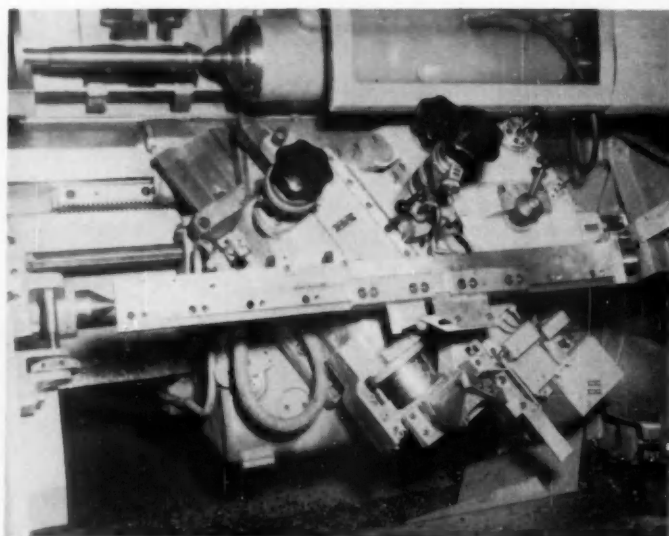


Fig. 2—Close-up showing the tool and template for machining the head or pinion end of the forging in the second Fisher lathe.

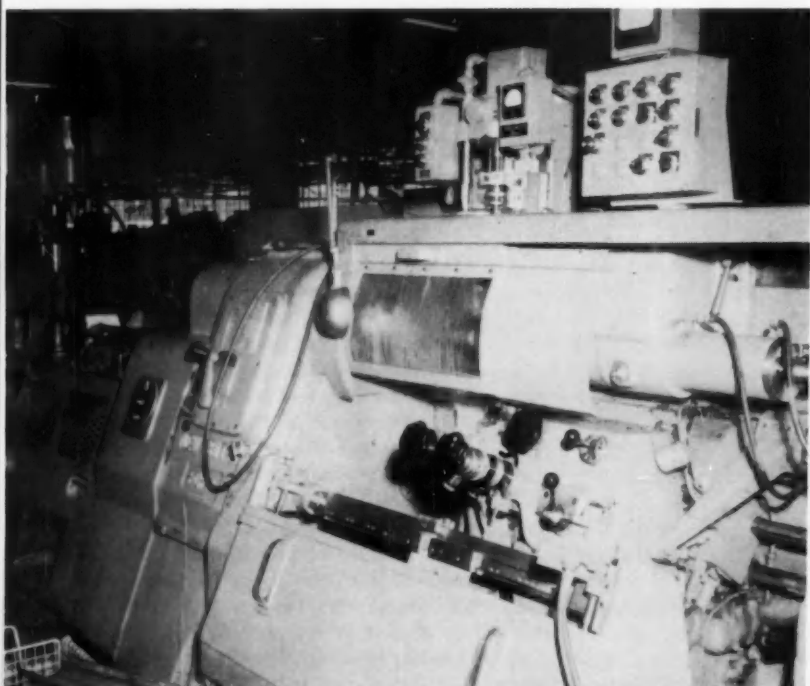


Fig. 1—In this, the first of the Fisher lathes used for turning stem pinions, five steps are rough turned using the first template, and then are finish turned with the tool controlled by the second template.



Fig. 3—Another view of the same setup shown in Fig. 2 as it appears from the headstock end.



Fig. 4—Same lathe appearing in Figs. 2 and 3 but viewed from the tail-stock end. Note chuck for driving work piece.

tion to the changing diameter of the cuts. This makes it possible to employ the most efficient cutting speed for both roughing and finishing.

Time for the two cuts on the head end is about 40 sec, loading and unloading included. Thus, total floor to floor time for the two Fisher lathes is about 90 sec.

Another type of part machined with high economy on Fisher lathes is the stator support for automatic transmissions. It has a large flange

at one end and a smaller flange, tapered on one side, near the other end, with three turned steps between the two. Also machined are two square grooves, one being next to the smaller flange.

These forgings are roughed with the tracer tool following one template and finish cuts are then produced as the tool follows a second template that is rocked into operating position. On these machines, there is also a vertical slide that is moved by an air plunger

when a solenoid operates a control valve. Tools on the slide are primarily for producing narrow grooves but the one next to the smaller flange is also used to make a facing cut and thereby reduces the load on the tracer roughing tool.

As the tracer lathes operate automatically, once they are loaded, one man easily handles two machines, unloading, reloading and starting one of the pair while the other runs through its automatic cycle.

### White Motor Pays \$10 Million For Diamond T Motor Car Co.

White Motor Co. of Cleveland has purchased the Diamond T Motor Car Co. for \$10.1 million and will operate the Chicago heavy-duty truck firm as a wholly-owned subsidiary.

Under terms of the agreement, White receives the inventories, patents, trade name and good will of Diamond T. The subsidiary will operate under the name of Diamond T Motor Truck Co., with former president Z. C. R. Hansen continuing as president of the new subsidiary.

White will pay Diamond T, now to be known as DTM Corp., within 12 months. White will lease DTM's Chicago plant for one year with options for renewal of the lease.

Diamond T's net income for 1957

was \$806,325, after adjusting to the sale price, on net sales of \$56,323,000. A year ago the firm reported earnings of \$1,293,320 on sales of only \$45,427,000.

### Five States Propose Increases In Vehicle Sizes and Weights

Proposals to increase vehicle size and weight limits have been made in five states, according to a survey by the National Highway Users Conference.

In Mississippi, a bill would up maximum gross weight limits to 59,000 lb on designated highways and 55,650 lb on other routes. In Massachusetts, a bill would allow a 10 per cent rise in gross vehicle weight limits for a two-year trial period.

Two bills before the Kentucky leg-

islature would raise single-axis weight limits to 19,000 and 20,000 lb, respectively. In New York, a 40,000-lb limit on any two consecutive axles of a three-axle vehicle is proposed.

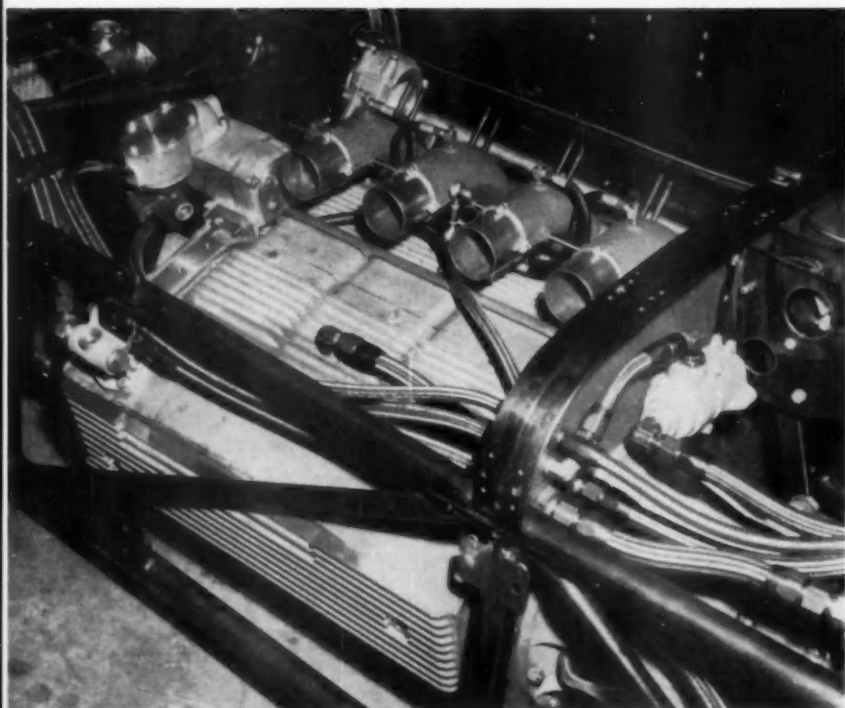
Proposed increases in vehicle height limits to 13½ ft have passed one House in both Kentucky and Michigan.

Proposals to increase length limits for vehicle combinations to 50 ft have passed one House in both Kentucky and Mississippi. In Michigan a bill would permit 40-ft trailers and semi-trailers, and another permits a length of 40 ft for all single units.

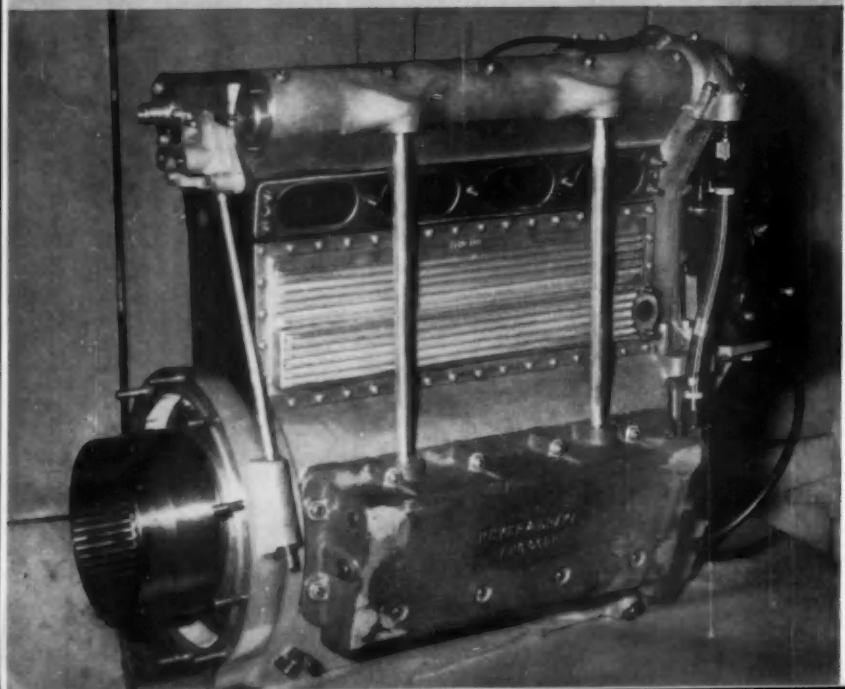
New York recently passed a bill making permanent a 50-ft vehicle combination length limit that was scheduled to revert to 45 ft in 1960. Also in New York, a bill permitting local buses a width of 102 in. has passed both Houses.

By  
R. Raymond  
Kay

## Inclined Engines Catch On



**MEYER & DRAKE ENGINES**



**C**AN a race engine lie on its side and win the Indianapolis 500? Well, last year's winner, George Salih's Belond Exhaust Special, proved it can. So much so, that at least five cars will try it this year at the 42nd Annual Speed Classic on May 30.

Everything is in high gear for another "fastest and richest" race in history. It will take 141 mph average qualifying speed to get one of the 33 starting positions. Fifty-six cars will battle it out.

Barring accidents, and given favorable track conditions, speed for the race should average 136.5 mph—a new high.

There are hardly any radical engineering changes in this year's entries. Last year saw 22 new cars—14 of them built by Frank Kurtis. Owners tend to wait about three years to get full value out of their investment.

How about foreign car entries this year? As usual, it doesn't look as if any will show up.

Once again, the rugged, reliable 4-cyl Meyer & Drake 255-cu-in. Offenhauser engine will dominate the race. But to meet the needs

### **TOP—**

Side view of mounted Meyer & Drake engine. Fuel pump in upper left. Behind fire wall, in right center of photo, is Chapin oil filter. Wagner-Lockheed brake master cylinder mounted on fire-wall. Firewall is Dow magnesium plate 2-FS-1.

### **BOTTOM—**

The Meyer & Drake 270 cu in. Offenhauser engine modified for use in a near-horizontal position. Two  $\frac{1}{8}$  in. x  $13\frac{1}{4}$  in. long seamless steel tubing drain lines are installed from underside of cam housing to new side mounted oil sump pan. Flexible hose drains cam tapper, emptying into new oil sump pan. New side mounted oil sump plate provides a reservoir to empty lower cam housing. Also, Meyer & Drake built new fuel pump drive with 2:1 reduction using gear drive underneath the magneto drive which runs at crankshaft speed.

# at Indianapolis

**Engines with Cylinders in Near-Horizontal Position, Independent Front Wheel Suspension, and Special Fuel Tank Construction Feature some of the Cars for the 500 Mile Event.**

of the engine-on-its-side designers, modifications had to be made. With the engine installed in a near-horizontal position, the cylinder centerline slants upward at an 18 deg angle. This arrangement lowers the center of gravity about  $3\frac{1}{2}$  in. And it improves handling on the track at high speed, especially in the turns.

Leo Goossen, Meyer & Drake's chief design engineer, came up with these changes to make the near-to-horizontal engines work better:

(1) New oil sump attached to the crankcase in place of the conventional side plate.

(2) New housing cover for the lower camshaft.

(3) Two new oil drain tubes

connecting the low cam housings to the oil sump. New cam gear cover to take care of the additional oil drainage.

(4) New scavenging oil bosses in the crankcase. New fuel pump drive. New air intake elbows with right angle turn to provide clearance for low engine hood silhouettes. Also, fuel nozzle repositioned.

Hilborn fuel injectors, now in use on almost all Indianapolis cars, will have a new type injection nozzle for better acceleration. Hilborn's fuel injector was first described in AUTOMOTIVE INDUSTRIES May 1, 1949.

Race car designers always strive for increased corner speeds. A fraction of a second per turn saved

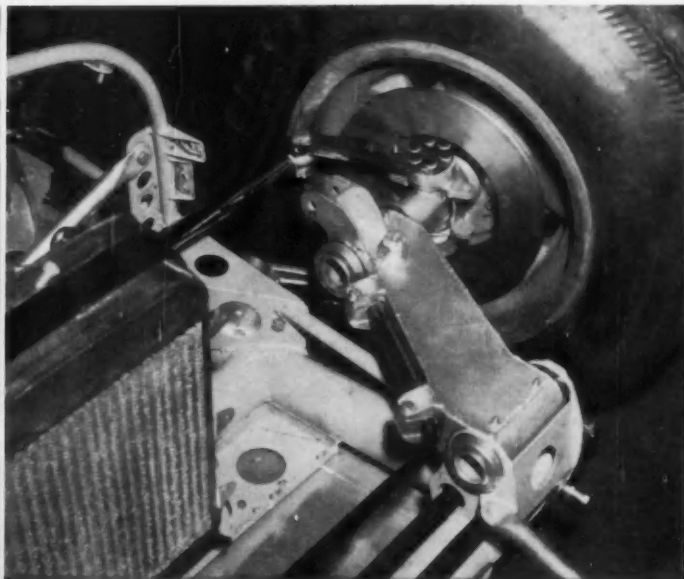
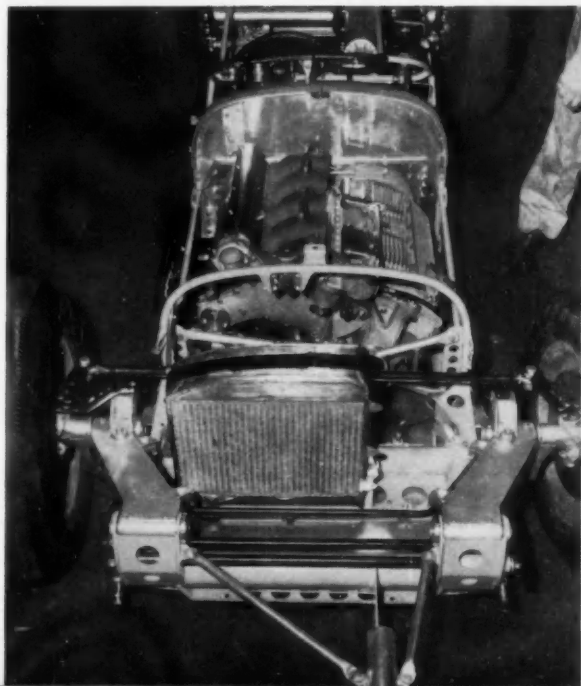
means so much, for there are 800 left-hand turns in this annual thriller. Straight-away speeds have stayed about the same for many years, but corner speeds have soared.

Nothing really new has showed up at Indianapolis in a long time. Almost every car in the race has had similar chassis and suspension. And almost all have mounted the good old workhorse, Meyer & Drake's Offenhauser engine.

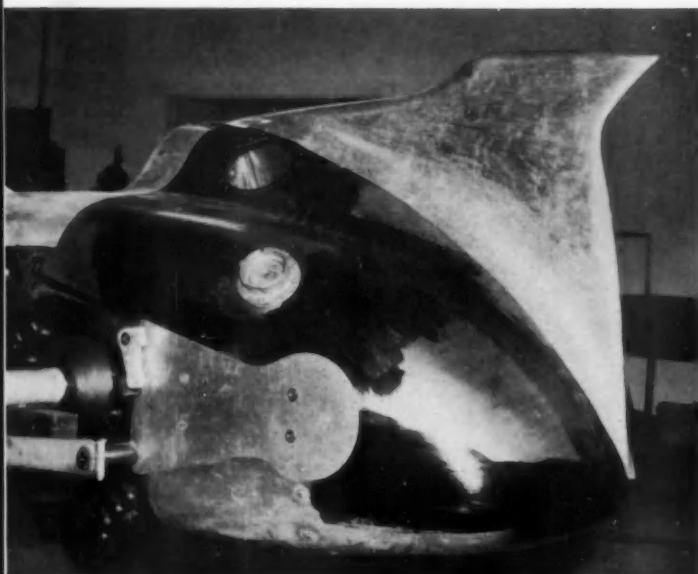
This year, however, Frank Kurtis, whose cars will again show up in some 23 of the 33 starting positions, is trying something new. Keep your eyes on the D-A Lubricant Special. It has no front axle. Kurtis designed it with independent front wheel suspension.

*At left, below, front view of D-A Lubricant Special shows independent suspension assemblies, and Meyer & Drake engine inclined at 18 deg from horizontal.*

*At right, below, lower wall frame assembly of D-A Lubricant Special is 3 in. by 0.083 chrome moly. Box section trailing arm from suspension assembly fabricated from 0.083 wall 4130 chrome moly and box 12 in. long by 3 in. high. Stub axle is  $\frac{1}{4}$  in. wall by 2 in. diameter by 8 in. long. Anti-sway bar (in black) shown in mounting brackets paralleling suspension. The steering arm is  $\frac{3}{8}$  in. chrome moly; tie rod is  $1\frac{1}{8}$  in. diameter.*



**D-A LUBRICANT SPECIAL**



**J. C. AGAJANIAN SPECIAL**  
Built by Eddie Kuzma



**TOP LEFT—**

Right rear of view shows design of aluminum fin in J. C. Agajanian Special built by Eddie Kuzma. It is expected to provide greater stability. In center of 70 gal fuel tank is 3-in. spring-loaded fuel filler cap.

**TOP RIGHT—**

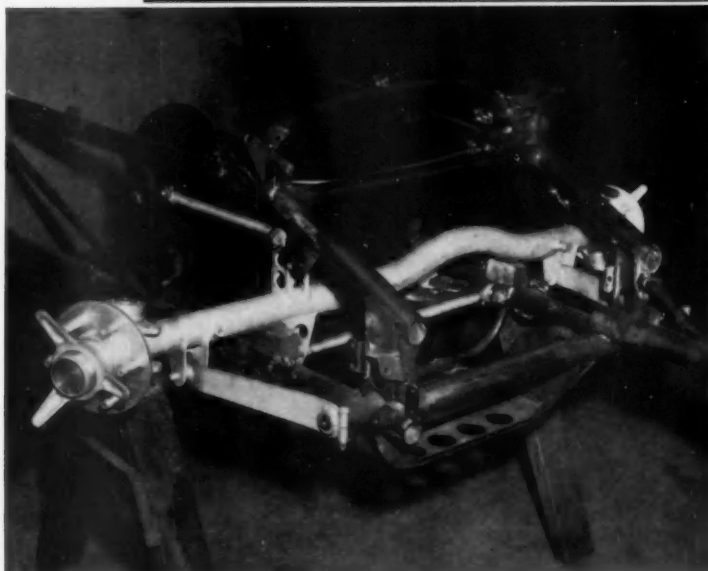
Refueling system developed for J. C. Agajanian Special. Car builder Eddie Kuzma uses handle bars on nozzle for quick connect and disconnect on car's fuel tank. Fuel tank provided with 3-in. spring-loaded fill cap. When connected, system automatically pumps in gas at high speed. When disconnected, it automatically stops pumping gas and seals tank.

**IMMEDIATE RIGHT—**

Ansted-Rotary Special built by Eddie Kuzma. The front axle is fabricated from 2 1/8 in. chrome moly tubing. Note new flat torsion bar arm, 1/4 in. by 2 in. Shown here is the Halibrand spindle and three-eared knock-off nut.

There's little doubt that solid axles contribute to front end stability. But Kurtis, always looking for something he hopes will be better, feels he has a real hot development. The new independent trailing arm torsion bar suspension, he believes, will give truer steering geometry for even greater stability. The design should permit the left front wheel to hug the ground around curves, make for longer tire life, easier steering, and smoother handling.

Frank Kurtis told AUTOMOTIVE



**ANSTED-ROTARY SPECIAL**  
Built by Eddie Kuzma

INDUSTRIES that this type of suspension would give passenger cars an easier ride. There could be more freedom in engine placement. Installation of his design would be simpler than today's passenger car

suspension systems, he believes.

Design of the D-A Lubricant Special, Kurtis Model 500-H, follows the engine-on-its-side trend. A Meyer & Drake Offenhauser engine lies at 18 deg from the hori-

—TOP

Left rear of Novi car originally built by Kurtis. Just below wheel is torsion bar arm with torsion locking adjustment. Upper left of illustration, along-side driver, is 28 gal auxiliary fuel tank. Right side shows 53 gal main fuel tank. Both fill from same opening in auxiliary tank. Car carries considerably more fuel than other Indianapolis cars for powerful Winfield engines eat up more gas.

—MIDDLE

A. J. Watson shop photo shows two new car components in front and old model in rear. All are John Zink Specials. Nose assemblies standing on floor are 0.050 sheet magnesium. Tail sections are fiberglass. All body metal, except hood, is made from magnesium.

—BOTTOM

The Duncan-Capanna Special with a highly modified DeSoto V-8 engine. Only claimed stock parts are: block, head, rocker arms, rocker arm stands, oil pan, and valve covers. All other engine parts are custom made. Total engine weight is 510 to 525 lb. Mounting is upright, 6 in. off center to the left. Cylinder heads exposed outside the frame rail help cooling.

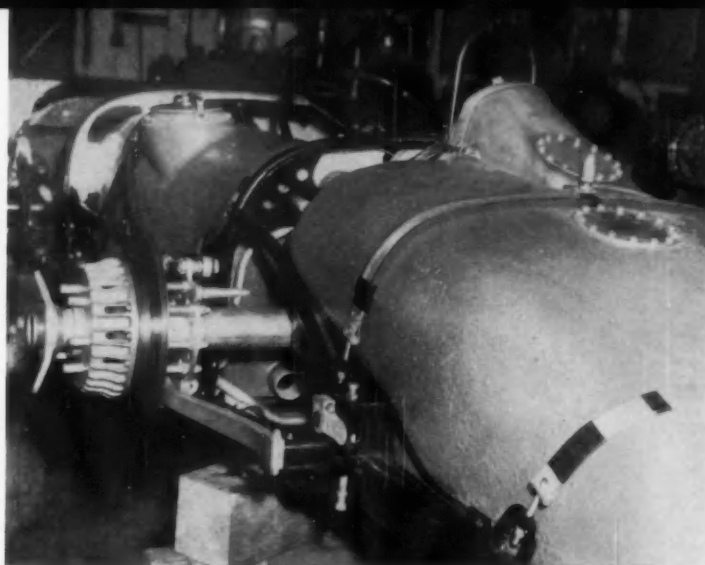
zontal. The independent front suspension will add about 30 lb, bringing the car's weight to 1775 lb dry.

This year's busiest builder, veteran Eddie Kuzma, put out three cars. Their chief feature is a 50 lb weight cut. Kuzma did it by using 0.051 ga instead of 0.064 ga aluminum sheet for the body and omitting a tail cover section. The fuel tank has no cover. It forms the outside shape.

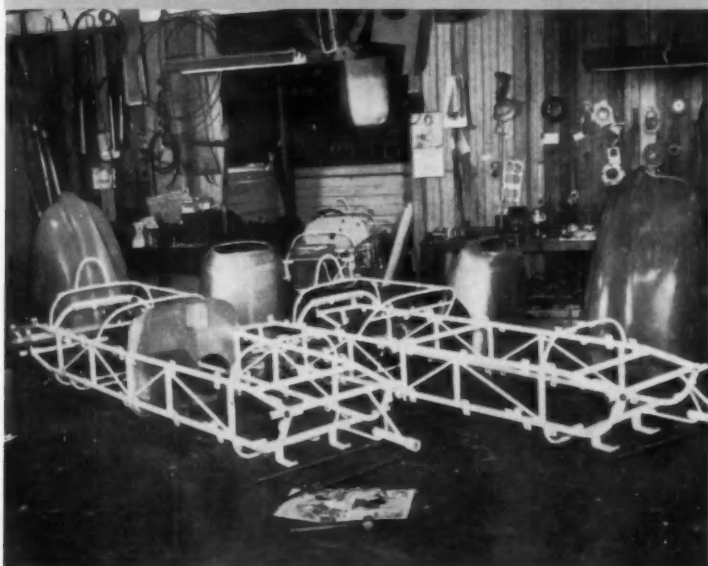
Another interesting feature of Kuzma's new Ansted Rotary Special is a flat torsion bar arm. It measures  $\frac{1}{4}$  in. x 2 in., with the left front arm  $13\frac{1}{2}$  in. long and right front arm 12 in. long. Kuzma put the right torsion bar arm above the axle, the left arm below. Rear torsion bar arms come to 14 in.

The 1952 winners, owner J. C. Agajanian and driver Troy Ruttman, will try for another cup in a new Kuzma car. To cut precious seconds during refueling, the builder is trying a new type pressurized system. (Cont'd on next page)

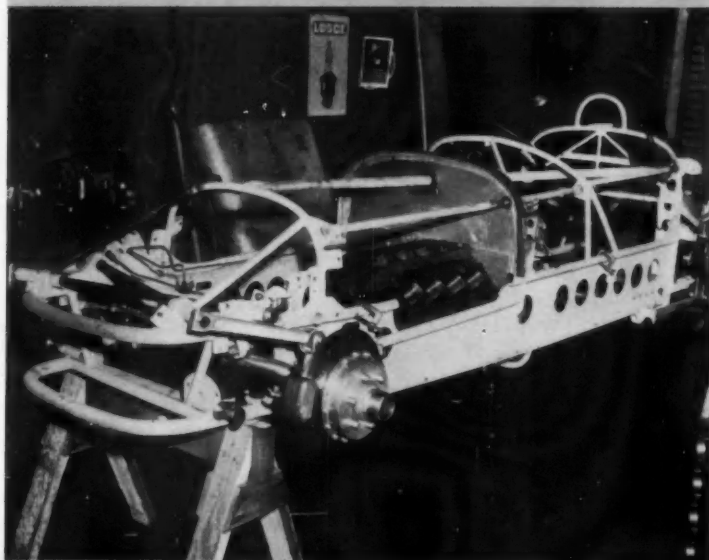
**DUNCAN-CAPANNA  
SPECIAL**



**NOVI SPECIAL**



**JOHN ZINK SPECIAL**





## LEADER-CARD SPECIAL

Right front wheel from front of Leader Card Special. Two separate brake assemblies work off same disk. Forward unit is single disk auxiliary system and rear unit is regular brake system. On top of 2 1/4 in. front axle is steering arm with drag link running back to steering box. Torsion bar arm runs forward and radius rod extends toward rear. Below torsion bar arm is Delco-Lovejoy double-action shock absorber which will be paired with Gabriel Adjust-O-Matic.

It works like this: A self-sealing coupling valve with handle bars is on the filling end of a 2 1/2-in. hose. The other end of the hose connects with the main fuel tank in the pit area, pressurized to 30 lb. The pit man puts the nozzle over a 3-in. spring-loaded filler cap in the car's fuel tank. A quarter turn of the handle bars automatically opens the tank and starts the refueling.

A reverse twist of the handle bars shuts off the fuel and seals the car's tank. Kuzma believes he can pump 40 to 50 gal in only 7 or 8 seconds. Buckeye Iron and Brass Works, Dayton, Ohio, built the system.

This year's race will be the Novis' 13th try at Indianapolis. When racing car experts get together, they pretty much agree that these are the fastest and most powerful race cars today. They point to driver Tony Bettenhausen's sizzling 176.8 mph qualifying mark at last year's Monza "500" in Italy.

The Winfield engines are ready to go again. Mechanic Jean Marcenac believes he can get close to 650 hp out of the V-8 168-cu-in. supercharged engines—almost 100 hp more than their original rating.

The Belond-AP Special, the car that won last year's race, installed a new crankcase breather. It's the only engine change. Twin front end shock absorbers have replaced the single units previously used and new design jack pads have been installed fore and aft.

A chrome plated roll bar and arm guard were added to the car as safety features. The steel arm guard will protect driver Jimmy Bryan's elbow and arm from accidental contact with the right rear wheel which is very close to the cockpit.

The Kurtis-built chassis have changes this year. Frames are lighter, and front axles, steering, and rear suspension are modified. To improve stability, Luigi Lesovsky chose a Watts linkage type front suspension. Steering gear drag link is now on the outside. Steering from the right front wheel replaces former center post steering. Front sway bar is in compression instead of tension.

Both Novi cars have a changed fuel system. The oil tank is now in the front instead of rear. It's alongside the engine, on the right. Taking the oil tank from the rear leaves room for an eight gallon

larger gas tank. Since the powerful Novis only get 3 1/2 to 4 mpg, they carry two fuel tanks. The main 53-gal unit in the rear and a 28-gal auxiliary is located beside the driver. Both are filled through one opening in the auxiliary. Feed control is through a three-position fuel selector valve beside the driver.

Other Novi modifications are increased radiator air intake area, enlarged 40 per cent for better cooling, and relocation of shock absorbers for direct action.

There is a secondary suspension system at the rear of the car. The idea is to give extra support for a heavy fuel load. Luigi Lesovsky is trying it for the first time, he thinks, on an Indianapolis car. It's a modification of H. A. Chapman's entry. Each wheel has a separate torsion bar. The extra suspension comes from a third torsion bar that works off both wheels when there's a heavy load.

This car, too, sheds the rear tail skin. Tail and fuel tank are now the same piece of metal. Lesovsky has an outside oil tank on the car this year. The tank, shaped like a ham can, shifts more weight to the left side, an advantage in the 800 left hand turns.

Builder A. J. Watson expects to have three John Zink Specials ready to roll. One is a new car, patterned after his 1955 and 1956 winners. Watson gets his weight-saving by use of magnesium panels and fiberglass tail sections.

Quinn Epperly turned out two cars this year, the Demler Special and one for Meyer & Drake. This builder's trademark is his precise construction practices. He's one of the few in the business who uses a frame jig to mount chassis rails.

The Belond Exhaust Special, which popular Sam Hanks pushed to a winning 135.6 mph average speed record last year, will have Jimmy Bryan in the cockpit. Bryan won the Monza "500" in Italy last year. Builder George Salih's engine-on-its-side design started the trend so evident this year.

The Duncan-Capanna Special  
(Turn to page 164, please)

# Design Details of the Perkins Automobile Diesel

**F.** PERKINS Ltd. of Peterborough, England, has introduced a small high-speed Diesel engine designed specifically for passenger cars and light trucks. As its designation, "Four 99" suggests, it is a four-cylinder unit of 99 cu in. displacement, and develops a maximum of 43 hp at 4000 rpm. Bore is 3 in., stroke 3.5 in., and compression ratio 20 to 1. Weighing only 320 lb without fly-wheel, housing and starter, the engine is claimed to be the world's smallest four-cylinder water-cooled Diesel.

The direct-injection unit employs a patented combustion system developed especially for its small-bore cylinders. The upper part of the combustion chamber is a hemi-

sphere recessed in the cylinder head. A machined insert, forming the lower portion, contains the oval port or throat-connecting chamber to cylinder. Fuel is injected by a pintle-type nozzle.

During the main part of the compression stroke, air is forced into the chamber vertically through the port, producing swirl that moves transversely across the nozzle. In the latter stages of compression the flow of air is gradually changed from vertical to horizontal.

When combustion occurs, the remaining air is transferred violently through the specially-shaped port, promoting considerable turbulence in the fuel-air mixture already present in the chamber. Com-

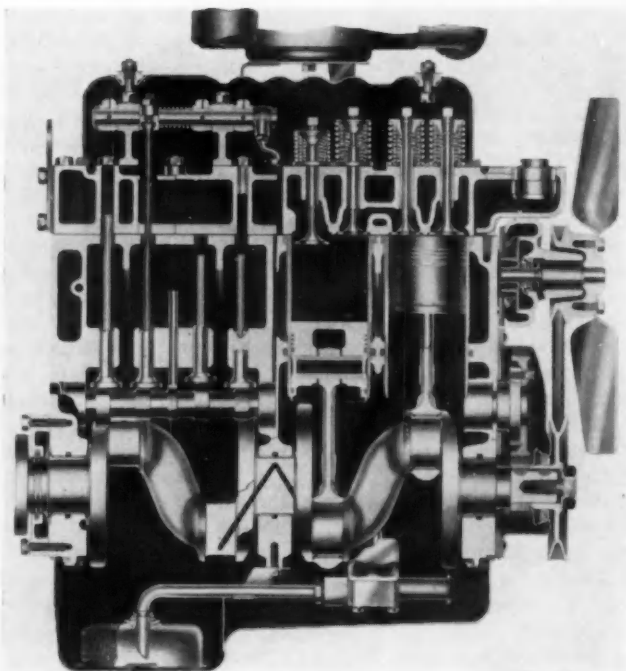
plete combustion is thus effected, it is stated, and the maximum amount of air is utilized.

The rotary-type C.A.V. fuel pump, capable of running at speeds well over 4000 rpm, features hydraulically-controlled timing and small inert masses. It comprises two opposed cylinders and plungers which are rotated inside a movable cam ring, and an eccentric vane feed-pump that maintains pressure against the inner faces of the plungers. The cam ring is radially located by a spring counter-balanced by a hydraulic plunger actuated by fuel feed pressure. Movement of this plunger thus increases with engine speed, advancing the timing.

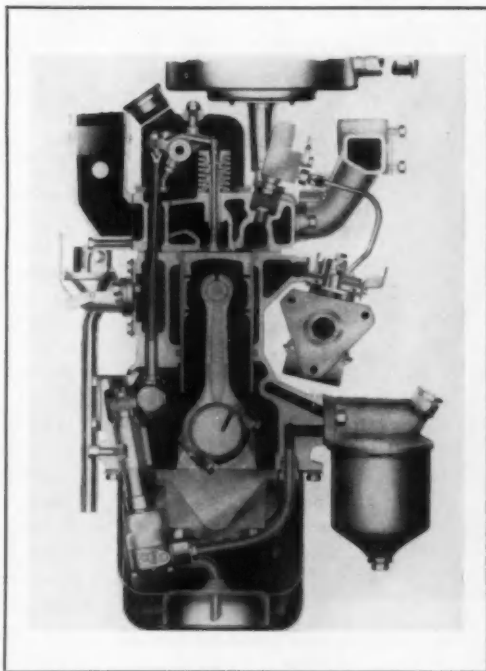
Cold-weather starting is assisted by a C.A.V. "Thermostart" heater in the induction manifold—an aluminum die casting.

This Perkins engine has been fitted experimentally in a number of medium-size British cars and taxis. It is understood that several British and European vehicle manufacturers are interested in the applications of this automotive Diesel.

*Longitudinal sectional view of the Perkins Four 99 engine*



*Transverse section of the engine showing design of cylinder head, location of fuel injector, etc.*



By  
**Andrew W.  
Shearer**

# Bright Prospects for Future Growth

*Keynote*

## Powder Metallurgy Show and Meeting



**George A. Roberts, president of the  
Metal Powder Industries Federation**



**Kempton H. Roll, executive secretary  
of the Metal Powder Industries Federation**

**D**ISCUSSIONS and exhibits of new technical developments in powder metallurgy attracted over 1000 design engineers, metallurgists, and industrial executives to the 1958 Powder Metallurgy Show and Meeting in Philadelphia last month (April). Accented throughout the three-day event were the cost-cutting possibilities which the powder metallurgy process offers in a "hard sell" market.

An air of confidence in the bright future of powder metallurgy, inspired by its success to date as a modern and economical method of metal forming, was everywhere in evidence. Manufacturers of powder metallurgy parts and processing equipment, as well as producers of metal powders, expressed the conviction that the industry is on the threshold of an era of tremendous expansion. The automobile industry still remains the largest single market for powder metallurgy parts (see AI, April 15, 1958), but applications in other fields continue to grow at a rapid pace.

Indicative of the trust which the powder metallurgy industry places in its continued mushrooming growth was the announcement that a federation of individual industry groups, which supplants the former Metal Powder Association, has been formed. Known as the Metal Powder Industries Federation (MPI), it includes four individual trade associations — Metal Powder Producers Association; Ferrite Manufacturers Association; Metal Powder Core Association, and Powder Metallurgy Equipment Manufacturers Association. Also included in the federation is a tech-

nology division, which will function through the newly-created American Powder Metallurgy Institute. Its main responsibility will be in the area of technical development, with provisions for market research activities as well.

Dr. George A. Roberts, vice-president of Vanadium-Alloys Steel Co., was elected president of the Metal Powder Industries Federation. Kempton H. Roll, current executive secretary-treasurer of the Metal Powder Association, was named executive secretary of the new organization. Each of the four individual trade associations comprising MPI will be headed by a president and a board of directors.

### TECHNICAL SESSIONS

Of special timely interest at the technical sessions was a paper on "Metal Powders in Missile and Rocket Fuels," presented by Loring Frazier of Metal Hydrides, Inc. He emphasized that metal powder producers must constantly improve control of particle size, narrow size limits, and produce powders with carefully controlled surface conditions to meet the flammability, chemical stability, light weight, and other requirements of missile and rocket fuels. Boron, aluminum, magnesium, and zirconium were cited as metal powders having a particularly big future in such fuels.

"New Powder Metallurgy Applications in the Metal Cutting Field" were the subject of a paper by H. Frommelt of Spring Garden Institute, Philadelphia. Single point tools, such as lathe tools and boring bars, and multi-tooth cutters such as milling cutters are now

*(Turn to page 150, please)*

# New Welding Techniques Discussed at Annual Meeting of AWS

By Kenneth Rose

**M**EETING in conjunction with the American Society of Mechanical Engineers' Metals Engineering Conference, the American Welding Society heard many interesting papers upon the welding of ferrous and non-ferrous metals and alloys at its 39th Annual Meeting in St. Louis April 14-18. Prominent among the papers presented were those dealing with the welding of metals important in missiles, rockets and airplanes. The Welding Show, held at Kiel Auditorium, drew an estimated 10,000 visitors during its three-day run.

## Welding Magnesium Alloys

Arc welding procedures for three recently developed wrought magnesium alloys were discussed in a paper by Paul Klain and L. F. Lockwood, Dow Chemical Co. Alloys are HK31A, containing 3.3 per cent thorium, 8.7 per cent zirconium in addition to magnesium; HM21XA, containing 2.0 per cent thorium, 8.6 per cent manganese; and HM31XA, with 3.0 per cent thorium, 1.5 per cent manganese. It was found that welds in these alloys were relatively insensitive to cracking, and that a tendency to undercutting could be eliminated by proper choice of rod and use of such techniques as preheating, inert gas backing, or use of a grooved backing plate. Static elevated temperature properties of the alloys were not affected by welding. Post-heating of the weld had little effect upon weld properties; corrosion



*Gustav O. Hoglund, Pittsburgh, was elected new president of the American Welding Society. Mr. Hoglund is head of the welding section of the Aluminum Company of America Process Development Laboratory. He takes office June 1.*

rates were not significantly affected, and there were no unusual metallographic changes, such as grain growth. Radiation and toxicity of thorium were not health hazards if adequate ventilation of fumes was insured.

## Alloys for Jet Engines

Some of the superalloys used in jet engines contain sufficient titanium and aluminum to cause oxide films to form when an attempt is made to braze them in

dry hydrogen with boron-nickel-chromium filler. In a study of vacuum and special hydrogen brazing methods, it was determined that a vacuum to 2 to 35 microns was necessary for successful vacuum brazing. Vacuum capacity had to be adequate to remove gas evolved from the powdered boron-nickel-chromium brazing alloy. Four special techniques for hydrogen brazing were worked out. The methods were used with alloys ordinarily unbrazable in hydrogen, and on alloys easily brazed in hydrogen. For these latter, joint strength by the special hydrogen techniques and vacuum method were equal, while the vacuum method gave higher joint strength than the special hydrogen methods with the former. The paper was presented by Ernst G. Huschke, Jr., and George S. Hoppin, III, General Electric Co.

## Nondestructive Testing

A method for irradiating weld filler wire and then measuring weld radiation for nondestructive testing of the weld was described in a paper by Paul T. Barnes, U. S. Naval Ordnance Test Station, and Gordon L. Locher, Western Radiation Laboratory. The filler wire is activated by irradiation with slow neutrons, using a moderator to control the irradiation. The weld is then made in an automatic welder, and examined by means of a high-sensitivity detector, with readout by either an indicating meter or permanent graphic record. Because of the low intensity of radiation, there is no danger to personnel from the wire or the weldment. The Navy had used this method in studying welds in aluminum alloys.

## Welding Aluminum Alloys

Automatic welds in 6061 aluminum alloy can be carefully controlled as to speed and heat removal by the jig so as to limit the amount of heat treatment necessary after welding, William L. Burch, Bell Aircraft Corp., told the meeting. In making 500-gal. missile propellant tanks of this alloy in the

*(Turn to page 168, please)*

# Zinc Die Castings Abound in 1958 Cars

**I**N the competitive search for fresh styling and engineering improvements, the automobile industry continues to rely heavily on the special advantages of zinc in many forms. Significantly, a number of car makers report a dramatic increase in their use of this versatile metal for 1958 models.

Zinc and zinc-base products are used by car manufacturers in the form of zinc die castings, brass, zinc chromate and phosphate paints for primers, zinc coated (galvanized and electrogalvanized) steel, and zinc oxide pigments for tire manufacturers. In 1957, 440 million lb of zinc went into automobiles and accessories.

The primary zinc market in the automobile industry is for zinc die castings because of the metal's low melting temperature, adaptability to casting in thin sections, high rate of production, and other desirable attributes. The volume of zinc used for die castings by automobile manufacturers has increased steadily. In 1950, for example, the average weight of zinc die castings per car was 43 lb. In 1957, the average weight exceeded 64 lb of zinc die castings, or over 70 lb of zinc total.

Versatile Metal Specified  
by Automobile Manufacturers  
for Many  
Functional and Decorative Parts  
as Zinc Research  
Moves Forward

Independent die casters report the trend toward heavier die cast zinc instrument cluster housings, larger die cast zinc tail lamp sections and headlamp assemblies, as well as the swing to die cast zinc roof trim and interior and exterior upper quarter panels. In addition, the growth in four-door hardtop models represents a considerable increase in use of zinc die castings for window frames.

Leading automotive user of zinc die castings this year (as last) is Buick with a total of 164.3 lb in the Roadmaster Model 75 four-door Riviera—an increase of almost 24 lb over the 1957 model. This figure represents 53 body parts supplied by Fisher Body, plus an additional 96 functional and decorative parts—a total of 149 zinc die castings used.

Buick engineers have specified zinc for such items as

## ZINC DIE CASTINGS IN AUTOMOBILE

### FRONT END

Radiator Grille and Moldings  
Grille Frame Sections  
Fender Wrap-Around Elements  
Head Lamp Doors  
(2-Eyed and 4-Eyed)  
Fender and Hood Ornaments  
Escutcheons

Car Name Letters  
Parking Light Frames  
Direction Signal Frames  
Rear View Mirror Assemblies  
Windshield Molding  
Air Scoops  
License Plate Frame

### UNDER THE HOOD

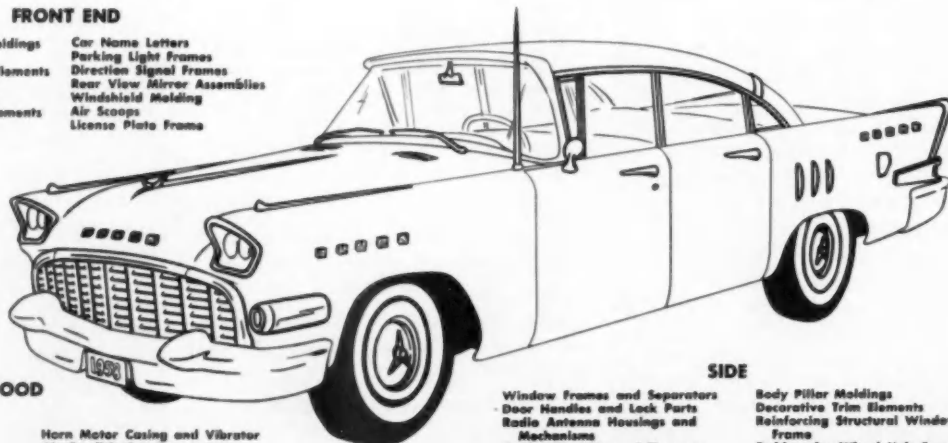
Carburetor  
Fuel Pump Bodies  
Vacuum Pump  
Ventilator and Defroster  
Diffusers  
Transmission Parts

Horn Motor Casing and Vibrator  
Air Conditioning Components  
Turn Signal Actuator  
Distributor Parts  
Blower Assembly Parts

### SIDE

Window Frames and Separators  
Door Handles and Lock Parts  
Radio Antenna Housings and  
Mechanisms  
Fender Wrap-Around Elements  
Side View Mirror, Frame and  
Brackets  
Scuff Plates

Body Pillar Moldings  
Decorative Trim Elements  
Reinforcing Structural Window  
Frame  
Emblem for Wheel Hub Caps  
Car Name Letters  
Gas Tank Spout Cover  
Gas Tank Access Door



the distinctive new radiator grille and frame sections (36.39 lb), rear lamp assemblies (8.8 lb each), carburetor assembly (6.9 lb), plus a variety of decorative trim parts inside and outside the car, as well as functional items under the hood. The heaviest die cast zinc part is the body radiator grille at 23.3 lb contrasted with the smallest, a rear view mirror component, at 0.005 lb.

The new Edsel is another line that exemplifies the upward trend toward the increasing use of zinc die castings by the automobile industry. All 18 models of the Edsel use a wide variety of die cast zinc decorative and functional parts (see AI, Jan. 15, 1958).

The 1958 Chevrolet is another liberal user of zinc die castings for many parts such as the windshield wiper motor assembly (4.5 lb), radiator grille header bar (3.4 lb), side ornaments (3 lb each), carburetor float bowl (1.5 lb), steering gear jacket insert (3.3 lb), carburetor air horn (1.0 lb), fuel pump assembly (1.5 lb), tail and stop light assemblies (1 lb each). In typical Chevrolet Biscayne models, the average number of zinc die castings runs from 35 to 37, with a total weight of from 35 to 40 lb, for parts ranging from a 0.023 lb speedometer flexible shaft assembly component to a 5 lb instrument cluster assembly.

The 1958 Oldsmobile is another car that makes full use of zinc die castings. The 88 Series employs a total of 41.6 lb of die cast zinc parts; the four-door Super 88 uses 48.5 lb; and the four-door 98 Series uses 49.7 lb. Included are such parts as four-barrel carburetor assembly (7.1 lb), rear lamp assemblies (6.5 lb each),

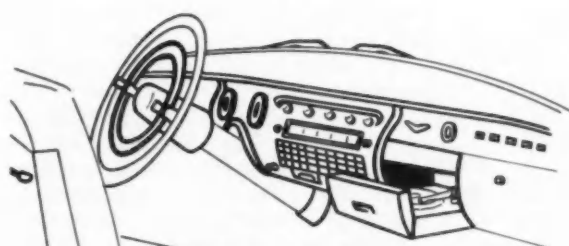


Shown above is 1958 Oldsmobile Econ-O-Way dual carburetor made of zinc die castings. Another—a four-barrel carburetor assembly—is also made of die cast zinc and weighs over seven pounds. Zinc die castings permit the rapid production of complex parts to extremely close dimensional tolerances "as cast".

instrument cluster assembly (5.2 lb), fuel pump assembly (3.4 lb), door ventilating regulator assemblies (4.5 lb each), and crown molding assemblies (3.6 lb each).

Chrysler Corp. continues to use zinc die castings in the 1958 Plymouth, Dodge, DeSoto, Chrysler and Imperial for such parts as instrument clusters, door handle pulls, window crank assemblies, lock assemblies, signal assemblies, license plate frames, ventilating

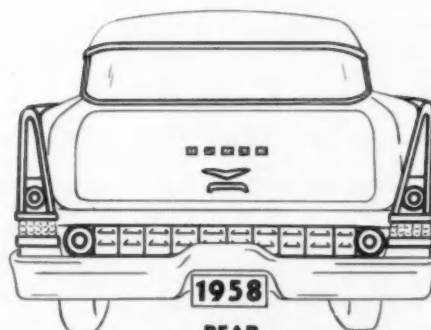
## INDUSTRY—1958 (COMPOSITE CAR)



### INTERIOR

Horn Ring  
Instrument Panel Bezels,  
Knobs, Grilles, Frames, Clusters  
Windshield Wiper Motor  
Body and Parts  
Door Handles  
Window Handles  
Window Cranks  
Ventilator Locks  
Dome Light Bezels  
Seat Adjusting Knobs  
and Mechanisms  
Various Parts of Window  
Operating Mechanisms  
Defroster Parts

Rear View Mirror Frame  
and Bracket  
Ash Tray Covers and Parts  
Instrument Panel Radio Parts  
Rear Radio Speaker  
Frames and Parts  
Foot Rail Brackets  
Ornaments and Trim  
Lever, Parking Brake  
Ignition Switch  
Rear, Upper Quarter Panel  
Record Player Parts  
Coat Hooks and Robe Rail Brackets  
Miscellaneous Ornaments  
Ventilator Locks  
Heater Parts



### REAR

Tail Light Frames and Assemblies  
Back-Up Light Frames and Bodies  
Trunk Ornaments, Handles,  
and Letters For Car Name  
Window Trim  
Quarter Panel Molding  
Fender Ornaments  
License Plate Frame

## ZINC DIE CASTINGS

### in 1958 Standard Oldsmobile

Part Name	Series			Weight in Lb
	88	S88	98	
Wheel assembly, steering.....	—	x	x	1.9650
Lamp assembly, rear, left hand.....	x	—	—	6.4731
Lamp assembly, rear, left hand.....	—	x	x	6.4729
Door assembly, head lamp, left hand.....	x	x	x	1.7516
Door assembly, head lamp, right hand.....	x	x	x	1.7516
Lamp assembly, rear, right hand.....	x	x	x	4.4468
Lens assembly, rear lamp, right hand.....	x	x	x	0.9307
Knob assembly, lighter.....	—	—	x	0.1212
Knob assembly, lighter.....	x	x	x	0.1212
Carburetor assembly, 2-barrel.....	x	—	—	3.2257
Carburetor assembly, 4-barrel.....	—	x	x	7.0591
Distributor assembly, ignition.....	x	x	x	0.1668
Switch assembly, starter.....	x	x	x	0.4118
Actuator assembly, T/S.....	x	x	x	9.2684
Switch assembly headlamp dimming.....	x	x	x	0.1480
Horn assembly, low note.....	x	x	x	1.0234
Cable assembly, speedometer.....	x	x	—	0.0482
Cable assembly, speedometer.....	—	—	x	0.0482
Cluster assembly, instrument.....	x	x	x	5.2300
Pump assembly, fuel.....	x	x	x	3.4262
Control assembly, light.....	x	x	x	0.1430
Control assembly, air, left hand.....	x	x	x	0.2462
Lever assembly, turn signal.....	—	—	x	0.0854
Column assembly, steering.....	—	—	x	0.7530
Housing, upper bearing.....	—	—	x	0.4250
Bowl, shift.....	—	—	x	1.2080
Shift assembly, steering gear.....	x	x	—	1.5340
Horn assembly, high note.....	—	x	x	0.9388
Emblem assembly, steering wheel.....	—	x	x	0.2260
Control assembly, wiper.....	x	x	x	0.2519
Knob assembly, windshield wiper.....	x	x	x	0.0561
Escutcheon, windshield wiper.....	x	x	x	0.0566
Arm assembly, windshield wiper, right hand.....	x	x	x	0.0625
Arm assembly, windshield wiper, left hand.....	x	x	x	0.0625
Ornament, hood.....	x	x	x	2.5000
Elbow connector, carburetor.....	x	x	x	0.0117
Lock assembly, ignition switch.....	x	x	x	0.0650
Switch assembly, courtesy.....	—	x	x	0.1410
Lever assembly, parking brake.....	x	x	x	0.2000
Switch assembly, back-up.....	—	—	x	0.0750
Letters on trunk lid and hood.....	—	x	x	1.1340
Cover, heat vent control.....	x	x	x	0.1280
Moulding assembly, instrument panel.....	x	x	x	1.3000
Emblem, radiator grille.....	x	x	x	0.3000
Handle, trunk lid, right hand.....	x	x	—	0.5450
Handle, trunk lid, left hand.....	x	x	—	0.5450
Handle, trunk lid, right hand.....	—	—	x	0.5850
Handle, trunk lid, left hand.....	—	—	x	0.5780
Script, front fender.....	x	—	—	0.6800
Cover assembly, radio receiver hole.....	x	x	x	0.4749
Moulding, rear lamp crown.....	x	x	x	2.3038
Number of Zinc Castings.....	43	54	59	
Total Weight: 88.....				41.5527
S88.....				48.5017
98.....				49.7063

window frames, as well as such functional parts as carburetor assemblies and fuel pumps.

Among the independents, models of the Rambler line use die cast zinc body radiator grilles and frames, instrument clusters, door and window hardware, and a large variety of trim parts.

Several 1957 design trends effectively served by zinc die castings continue to gain impetus in 1958. Tail lamp assemblies grow more elaborate with tail fins carrying as many as three lights each; dual headlamps are now the rule. Although head and tail lamp assemblies are not as massive as in 1957, the total amount of zinc used by the automobile industry for this application is much greater than in the past. The tail lamp bases for the 1958 Ford's new horizontal tail lamps are zinc die castings, each weighing 4.5 lb.

Another trend is toward ornate, intricate instrument panel designs with die cast zinc instrument clusters and complete instrument panels. Such optional equipment as dashboard radios and record players are also heavy zinc die casting users.

Hardtop models are more numerous this year; virtually all are equipped with die cast zinc window channels and moldings. These frequently weigh as much as 12 lb per car. The "no-draft" D-shaped pivoting window frames on front doors are made of zinc, as are inside and outside door handles, and window raising equipment concealed in the doors.

A relatively new conception in grille design that accounts for increased zinc consumption is the use of massive moldings to hold radiator grilles in place. Frequently, the weight of these moldings is greater than the weight of the grille itself. This is illustrated by the 1958 Chevrolet where the grille weighs 2.2 lb, while the five die cast zinc grille moldings total 12.13 lb. Other cars that carry heavy die cast zinc grilles include Buick, Pontiac, Edsel, Mercury, and Rambler.

Many air conditioning parts, such as frames, air ducts, and filter housings, continue to be made of zinc. Power steering and power brakes are other types of optional equipment where zinc parts are used.

Both to maintain its competitive position and expand into new automotive applications, the zinc industry sponsors continuous research aimed at improving the quality of zinc die castings as well as the processes which make them into finished parts. Investigations underway at Battelle Memorial Institute (commissioned by the American Zinc Institute) seek new, more economical, and improved finishes for zinc die castings. Current projects include research into methods of anodizing zinc, as well as ways of improving the effectiveness and economy of present plating and finishing practices.

Through the joint efforts of machinery manufacturers and independent die casters, some success is reported in the technique of vacuum die casting zinc alloys. This process promises a new range of properties of special significance to the solution of automotive design problems.

# COORDINATION between

**C**OMMUNICATION between Product Engineering and Manufacturing has come to be recognized as one of the most important functions of management in the automotive industries. Most organizations have grown so large and so complex that the coordination of these groups must be dovetailed in a specific manner to assure economic levels of cost and productivity.

The function of engineering is to look ahead into the future, to handle research and development, as well as to toil on the immediate task of grooming the product for the coming model year. Preoccupied with design development and the search for new materials and process engineering people have little time to devote to the amazing vista of developments in manufacturing methods, automation, and new equipment. Yet the product designer must become familiar with all of these if costs are to remain on a competitive basis.

The most important advance in this area is found in the initiation of liaison groups, called by different names in different companies, but all serving as the positive link between Engineering and Manufacturing. As will be seen later, in some companies the liaison group is a part of engineering and reports to the chief engineer; in one instance this group reports only to the general manager of the division or plant. In any event, this group of specialists shuttles between Engineering and Manufacturing to assure complete communication at every stage in the development of a new product.

By such means the Manufacturing Department has an opportunity to review the product design before it is frozen. This makes it possible to suggest changes in design or in fabrication to accommodate exist-

## Engineering and Manufacturing

By  
**Joseph Geschelin**

ing equipment and methods; or to make modifications to take advantage of entirely new techniques. The same process also covers other areas of the production scheme such as quality control, finishing methods, electroplating, cleaning, etc.

Actually the area of contact is even broader than is implied by engineering and manufacturing. The summaries given in this article show that purchasing, sales cost estimating, and other functions are included in the scheme of communications. Purchasing has a major role, for example, when considering what to make and what to buy. They seek new sources of supply; they accumulate data on comparative costs so as to enable the committee group to arrive at a decision early in the game.

This report is based upon an excellent panel meeting on the subject of Coordination between Engineering and Manufacturing at the recent SAE National Production Meeting, held in Chicago under the chairmanship of Carl A. Lindbloom, International Harvester Co. The panel was particularly effective because of its varied composition. It included two motor truck manufacturers; a producer of Diesel engines; two large com-

ponent parts makers; and a producer of steering gear linkage. This group represents a fair cross-section of size as well as diversity of product.

Analysis of the reports indicates that in many large organizations the chief engineer has complete control of the product from its inception to the point at which it is released to the factory. Thus the chief engineer occupies a position of unusual importance in the system of committee operations.

The summaries that follow emphasize that the selection of methods and machinery and process equipment, as well as the selection of materials and the decision to make or buy, all are products of committee action. They indicate the degree to which all members of these interlocked teams are an influence in the buying of materials and parts and equipment.

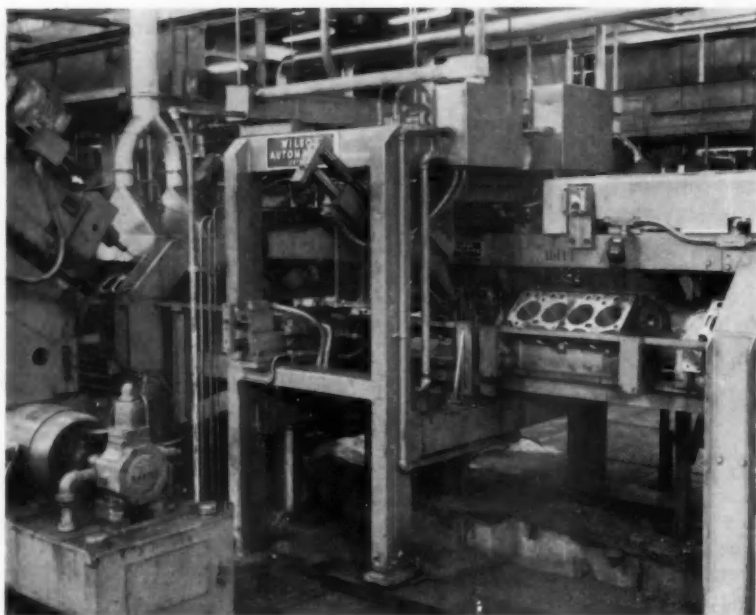
### Chevrolet

While Chevrolet has found it advantageous to centralize its engineering function, it has found it equally desirable to decentralize manufacturing facilities. According to R. S. Plexico, chief truck design engineer, Chevrolet Division, the keystone in effective communication between engineering and production is the Production Engineering Staff which serves as the liaison between these major functions. Incidentally, this group of specialists is part of the product engineering department, responsible to the chief engineer.

To illustrate how communication is developed at Chevrolet, Mr. Plexico selected a hypothetical case involving the design of a newly styled truck cab. Starting at the point where management approval has been gained, it is essential to have the Manufacturing Department enter the picture as early as possible. The Production Engineering staff, therefore, arranges a meeting of manufacturing representatives and design engineers in the Styling Studio, if possible.

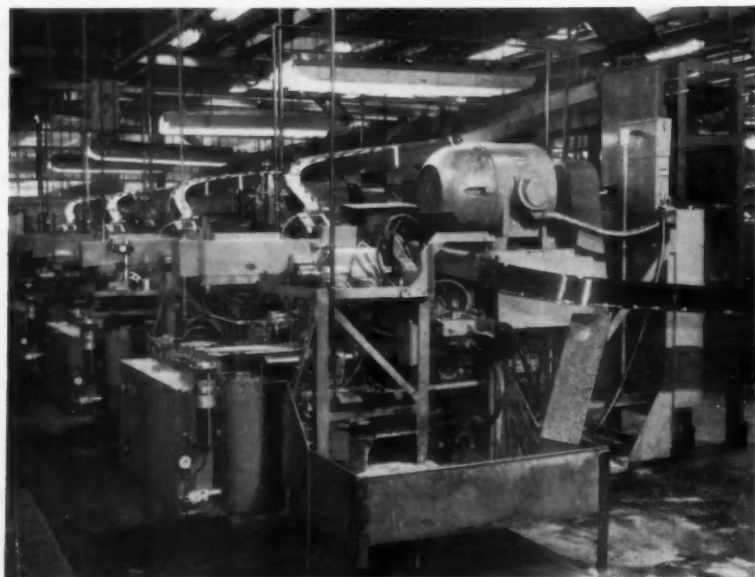
Here they study the clay models  
(Turn to page 115, please)

# Continuous Improvement in Equipment



One of the Wilson automation transfer links joining adjacent transfer machines. It incorporates a probing station as well as the transfer conveyor.

Automatic distribution and feeding of parts on the Fay automatic line for machining pistons. There are two rows of the Fay machines, each row being handled by means of the Lamb conveyor system. This view shows pistons being fed to each machine from a chute leading from the distribution conveyor in the background. The chute in the foreground is one that transports finished pistons to the lower level of the distribution conveyor.



**E**VEN when there are no major plants contemplated or tooling programs in prospect, automotive producers are constantly reviewing existing equipment and are installing individual pieces of new machinery to keep pace with advancement in progress. An excellent example of this is found at Buick whose facilities we toured recently.

The most extensive improvements were found in the Buick V-8 engine plant. At the present writing this facility has four individual cylinder block machine lines and five individual cylinder head lines. When this plant was first placed in operation only a few years ago each of the many individual transfer machines on each line was physically separated from the next group by a short section of gravity roller conveyor. This is in contrast to other arrangements where transfer conveyors have been used to connect from one machine to another.

This was done deliberately to permit at least visual inspection of the work by an operator at each junction. At least two basic reasons dictated this procedure. First of all, it was possible to make sure that work issuing from a given machine was satisfactory and could be inspected before routing to the next series of operations; and what was of equal importance, in the event of a shut-down of any machine it was still feasible to continue operating the rest of the line.

Since then the experience gained in operating the Buick lines has demonstrated that the equipment can be relied upon to run continuously without risk of breakdown. Moreover, maintenance procedures have been developed that assure positive and quick action in making tool changes without de-

# ... at Buick Engine Plant

By  
**Joseph Geschelin**

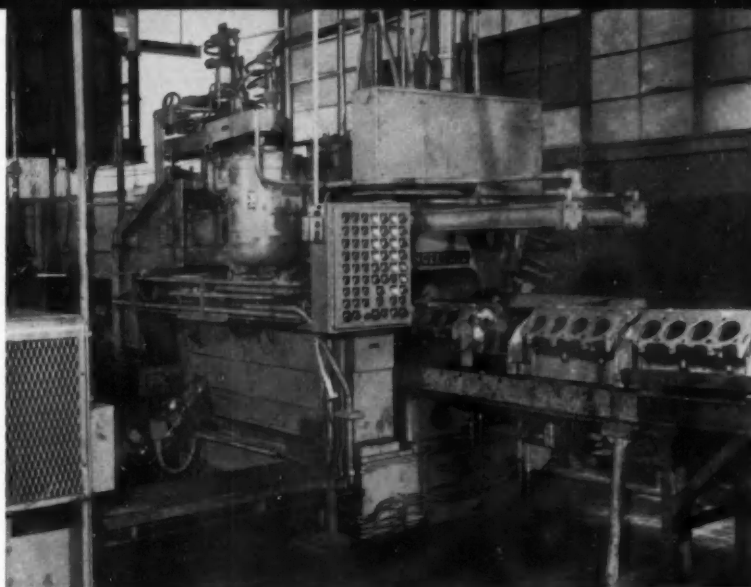
laying the line to any serious extent.

Stemming from this salutary experience Buick recently completed the installation of transfer connections between all transfer machines on the most recently installed cylinder block line. In addition, Buick has placed in effect two other major conveyor systems, linking certain operations near the end of the cylinder block line. It is only a matter of time before similar changes will be made in the other cylinder block lines.

Considering the transfer machine links first, it is of interest that all of these were supplied by Wilson Automation. In each instance, the transfer device consists of a transfer conveyor section, connecting the exit end of one transfer machine to the loading end of the next, plus a probing or qualifying station that inspects the major operations. Not only does this first line now function as a single, continuous production line but the introduction of Wilson Automation also releases for other jobs the operators formerly stationed between the individual transfer machines. The illustration shown here is typical of these connections.

One of the most striking of the

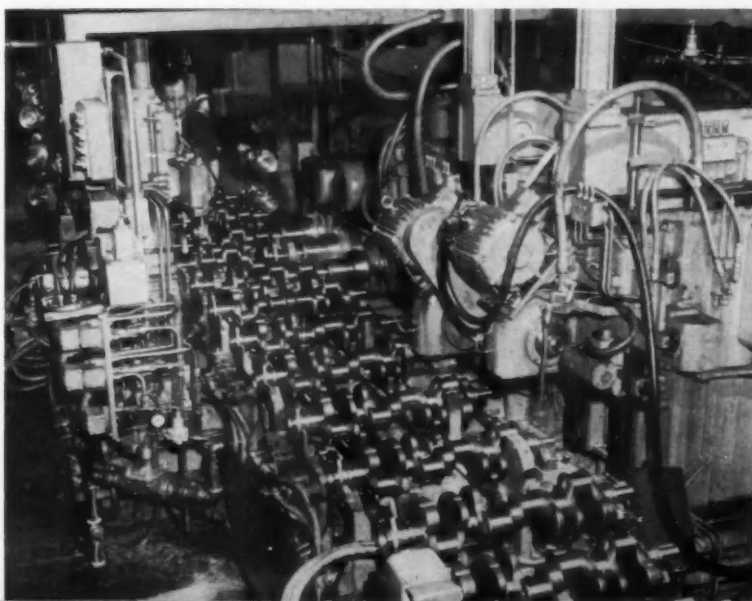
*Looking down the center of the Sundstrand special transfer machine for crankshafts. It turns and faces the flange at the station in the background; bores and reams the pilot hole in the stations in the foreground.*



*Qualifying of rough cylinder blocks by milling at several points is handled in this special Ingersoll milling machine. It was added at the head of block line recently.*

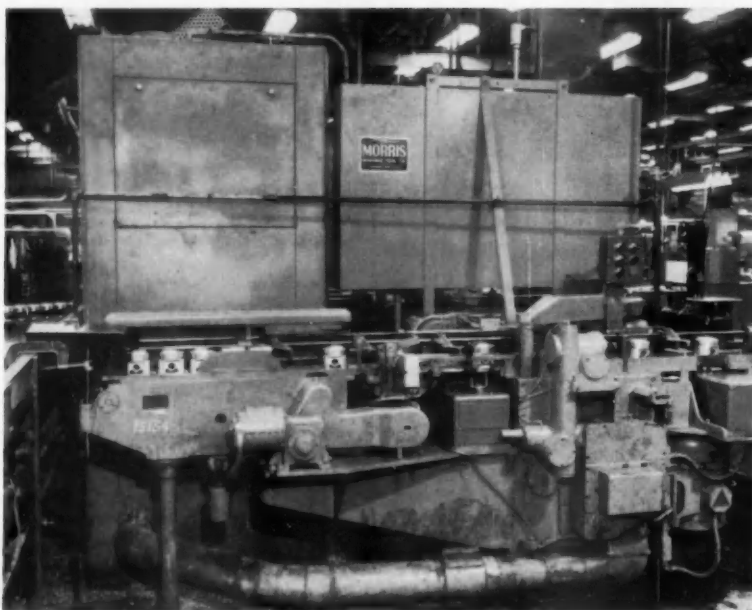


*Perspective view of the Producta transfer machine for milling crankshafts to length and milling locating spots for crankshaft turning lathes. The walking beam conveyor may be seen in the center of the machine.*

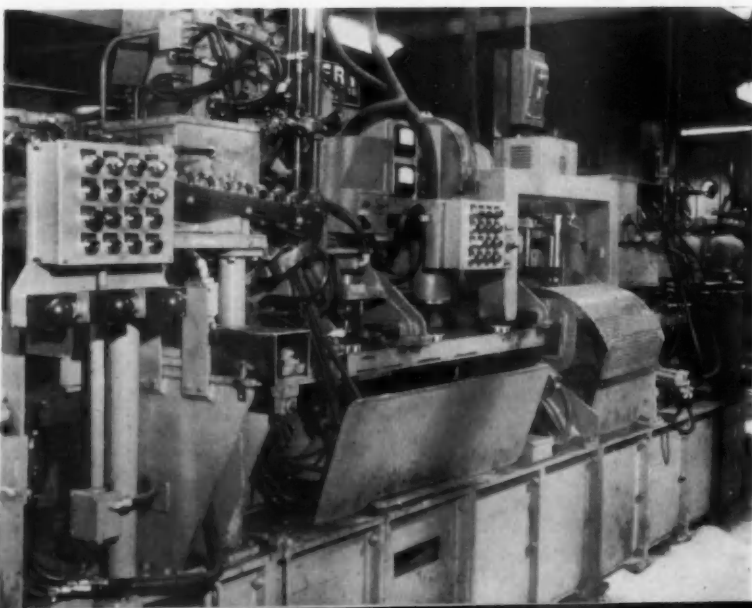




transfer conveyors in operation here is a rather intricate merry-go-round Lamb conveyor. As illustrated, it accepts cylinder blocks from four different machines onto one leg of the conveyor, then delivers them in sequence to each of five Ex-Cell-O cylinder boring machines. Limit switches perform the function of timing the loading of blocks so as to clear those already on the conveyor; while other limit switches installed on each of the cylinder boring machines control the function of loading by permitting loading only when there is room on the feeder line leading to the machine.



Still another transfer conveyor has been installed by W. F. & John Barnes. This one takes cylinder blocks from each of four, W. F. & John Barnes machines, then distributes the flow of blocks to each of three Ingersoll milling machines. The latter function is accomplished by first transferring the blocks onto a cross conveyor linking the Ingersoll mills. In this instance, it is of interest that the lines of W. F. & John Barnes machines feed in at right angle to the main conveyor. Consequently, it is necessary to turn each block by 90-deg before it is placed on the conveyor. This is done by means of a limit-switch controlled arm at each machine. As a block reaches the exit end of the machine, the swinging arm first reaches in and engages the under side of the cover rail to lift the block off the conveyor. Then at the proper clear signal the arm



*Lamb conveyor system installed in the cylinder block department. Blocks are loaded onto the conveyor at the left and distributed to the machines on the right according to demand.*

*One of the Morris weight mills on the piston line. Pistons come in from the left and go through the machine in an automatic cycle.*

*Automatic welding of a machine hub to the stamped front planet carrier is accomplished in this Expert transfer machine. Hub rings are fed to the first station on the track seen at the extreme left. The seam-welded joint is produced by means of a Lincolnweld submerged-arc welding head.*

swings outward and lowers the block onto the transfer conveyor.

In addition to these transfer systems, Buick has installed many items of new machine tools and we have selected a few examples in different departments of the establishment. The first of these is a new Ingersoll milling machine which has been installed as the first operation on the Ingersoll cylinder block line. It serves primarily to qualify the rough castings before they enter the machine line. To this end it has a pair of milling cutters on each side to mill the under side lugs at both cylinder banks. Then a milling cutter near the end of the machine mills the outer face of the distributor boss.

A new entry in the crankshaft department is a Producto (Productomatic) transfer machine tooled to mill the forgings to length, center both ends, then mill the locating spots for positioning the part in turning lathes. The machine, as illustrated, is made in two sections. The first section has two stations; the first for milling to length, the second for centering. The second section handles milling of the spots. Completely automatic in its cycle, the transfer of work through the machine as well as out at the end of the conveyor is handled by means of a walking-beam conveyor system.

Another addition in the crankshaft department, designed to facilitate productivity is a Sundstrand special transfer machine. Its function is to turn and face the crankshaft flange; then bore and ream the pilot hole in the flange end. In addition, there is an attachment for cutting the keyway on the opposite end. As crankshafts enter the machine, the first section has three stations for handling the work, each one provided with a chuck for holding the small end. The work then is moved progressively through the various operations by means of the built-in walking beam conveyor. It may be of interest to note that turning of the crankshaft flange is new at Buick, replacing the grinding operations formerly employed.

Switching to another of the Buick plants, we found an interest-



*This stub shaft at right is typical of the parts on which spline sections are produced in the familiar Michigan Tool spline rolling machines. In this instance it was found desirable to have one short spline section for register at assembly, as shown. The only modification required to this end was to grind out sections of the tooling as seen in the illustration above.*

ing piece of equipment for welding a hub to the front planet carrier. Here is a case where it is necessary to make a composite part in the interest of manufacturing economy. The planet carrier itself is a fairly large, drum-shaped, section made by hot pressing from steel strip. To produce an integral hub would require gathering at one end by upsetting. Consequently, it is simpler and cheaper to make the stamping, then weld a machined ring to produce the hub.

As illustrated, the Expert transfer machine is fully automatic in action. The carrier section is fed along a chute, while the hub ring is fed by means of another chute. The two parts come together at the first station where the hub is assembled in the bore with a press fit. The hub then is preheated at the second station. A qualified seam weld is produced by means of a Lincolnweld submerged arc head. The succeeding stations are employed as follows: Remove excess flux by suction; clean the weld; remove scale; clean after scale removal; and finally annealing at a station at the end of the line. Work



is transferred from station to station by means of a transfer bar.

Some of the major operations in the making of pistons also have been treated to an outstanding system of complete mechanization. Here we have a group of the latest type Fay automatic lathes arranged in two rows, as illustrated. They handle the turning of rings and

(Turn to page 158, please)

# News of the MACHINERY INDUSTRIES

By Charles A. Weinert

**Foreign Competition in the Machine Tool Field Chief Topic at the 56th Spring Meeting of the National Machine Tool Builders' Association in Chicago**

## **Machine Tool Business Improves in March**

Net new orders for cutting-type machine tools rose \$6.35 million in March over February, to a total of \$29.15 million. This 28 per cent increase is the third consecutive monthly rise from December's low of \$18.65 million.

Net new orders for forming tools rose 13 per cent in March, compared to February, to \$6.2 million. Total orders for cutting and forming type machine tools amounted to \$35.35 million, versus February's \$28.3 million.

Ludlow King, executive vice president of the National Machine Tool Builders' Association, in presenting the March statistics, made the following comment: "It must be pointed out that the March increase was due principally to a few sizable orders placed in special areas, and it was not enjoyed throughout the industry. The lumping of those orders in March will probably create an abnormal hump in the industry's sales curve, which has been "inching" upward. It quite possibly will be reflected in a falling-off in subsequent months."

## **Vickers Hydraulics Forum Scheduled for May 27-28**

The third Machine Tool Hydraulics Forum, sponsored by Vickers Inc., will be held in Detroit May 27 and 28. As usual this will be a closed meeting with participation by invitation. In general, its objective will be to explore improvements in hydraulic accessories and system design, and to discuss maintenance problems and their solutions. A news report will appear in this publication later.

## **World Trade Emphasized at NMTBA Spring Meeting**

How can American machine tool builders best meet foreign competition both here at home and abroad? How satisfactory have been the operating experiences with overseas subsidiary plants and other types of manufacturing arrangements? Are licensing and sub-contracting considered good solutions, or are subsidiary plants deemed preferable? When locating abroad, should you start fresh, or buy an existing company? How potent are the German and British machine tool industries?

Practical answers to these and many other related questions were given by highly qualified speakers at the 56th Spring Meeting of the National Machine Tool Builders' Association, held in Chicago on April 24-25. There the conclave of 460 top machine tool officials was treated to what was probably the most interesting and constructive program ever presented on the subject of "World Trade and Machine Tools."

### **U. S. Domestic Market**

Unless the present tariff situation is somehow corrected, the inevitable result will be the upbuilding of machine tool capacity in Europe and the decline of machine tool capacity in the United States, Alfred V. Bodine, president of The Bodine Corp. and president of NMTBA, told the audience.

"Not so many years ago," Mr. Bodine said, "imports accounted for only a small fraction of our

domestic sales. It is estimated that today imports of general-purpose cutting type machine tools are equivalent to about 30 per cent of domestic net new orders now being received.

"Not so many years ago our machine tool exports accounted for 30 per cent of our production. Currently they are down to about 10 per cent, according to NMTBA statistics, which account only for new machine tools; not used, rebuilt, or spare parts.

"Why this increase in imports, and decline in exports? The main reason, of course, is the price differential, which is accounted for primarily by the difference in wage rates. The average hourly rate of pay for skilled machine tool mechanics in the United States is about \$2.65. In Europe it ranges somewhere between forty cents and \$1.25.

"As to imports—a foreign machine tool builder can pay the United States tariff, which is 15 per cent for most types of machines and 18 to 20 per cent for a few types, and sell machine tools in this country at prices which we cannot possibly touch.

"When we come to the export side, the American machine tool builder not only faces the handicap of a great price differential—he faces tariff difficulties and nationalistic restrictions. The foreign countries which represent our major export markets have imposed tariffs, plus special fees and taxes,

that in some cases add up to 55 per cent. And several countries have licensing systems which amount to an embargo on some types of American machines.

"The fact is that the present tariff system is unfair and discriminatory. Our trade agreements are supposed to be reciprocal. I submit that an arrangement that permits one country to charge 15 per cent and another country to charge 55 per cent is not a reciprocal agreement.

"What is bound to happen, under present circumstances, is that American machine tool builders will move production capacity abroad. In every previous national defense emergency the machine tool capacity of the United States has been stretched to the utmost. How can this country be ready to defend itself if this capacity is reduced? And does it make sense for the United States, by its policies, to hold back our own machine tool capacity, while we build up machine tool capacity in Europe in locations which could be over-run by the Russians in a one-day push?"

Three remedial steps which the Government could take today were suggested by Mr. Bodine:

1. Establish tariffs or quotas on machine tool imports which will insure the national defense production capacity of the United States.

2. Persuade foreign countries to relax licensing and importation restrictions and agree upon a tariff arrangement which is in fact reciprocal.

3. Interpret the Buy-American Act so that it will not be mandatory for the Defense Dept. to buy a foreign-built machine tool if its price is as much as six per cent below a quotation by an American builder.

Beyond what Government might do, Mr. Bodine had this to say: "If we can't out-price our European competitors, we will have to out-design them. We sell machine tools abroad because of the superiority of our machines in design, in technology, and productivity. What we must do is to so improve our ma-

chines that considerations of increased output per piece per hour, and improved quality, will more than offset considerations of price differential.

"And that goes for the domestic market, as well as for visiting buyers from abroad. We must prove to our customers here at home that they can get more output per man per hour, and better quality, from our machines than they can from lower-priced machines to be imported from abroad."

As to the current situation on the domestic market, Mr. Bodine said;

"Everyone of us in the room has, basically, the same product for sale—namely, *reduced production costs*. What does American industry need, more than anything else, to work its way out of the current recession? *Reduced production costs*.

"How can costs be reduced? By throwing out old machine tools and replacing them with new models. How can a company get a competitive edge? By turning out a product of *better quality*. How can it get better quality? By throwing out old machine tools and replacing them with new models.

"I believe that sheer economic necessity, as the year advances, is going to spur machine tool replacement. Under the pressure of price and quality competition, companies will have to modernize or go out of business. The big sales job this year is that of proving to top executives the high cost of obsolescence. I am certain that by convincing customers of the need for replacement and for quality improvement we can develop a sales upturn as the year progresses."

### Foreign Market

During a panel discussion of factors relating primarily to the handling of foreign business, several interesting points were commented upon. The panel moderator was Henry D. Sharpe, Jr., president of Brown & Sharpe Mfg. Co. Panel members were: Noble B. Clark, sales manager, Machine Tool Div., The Warner & Swasey Co.; James

K. Fulks, executive vice president, Ex-Cell-O Corp.; George H. Johnson, president, Gisholt Machine Co.; and J. Herbert Myers, director of overseas operations, The Cincinnati Shaper Co.

For the sake of brevity, the highlights of this discussion will be mentioned in terms of what appeared to be the majority opinion in each case.

Question: Should an American machine tool company have a subsidiary manufacturing plant overseas? Answer: You have to analyze your position and if exports are important, you may have to build abroad to maintain or improve the company's position in that field.

Question: Is a subsidiary plant more desirable than a licensing or sub-contract arrangement? Answer: Yes, acquiring a facility is felt to be the best answer. Whether you sub-contract or license you are limited to a fee set by local governmental regulation which varies from five to as much as 10 per cent. There are no "teeth" in such contracts, and no guarantee the licensee or sub-contractor will maintain the promises he has made. Also, the foreign builder has less personal interest in the product, and may not always approach the accuracy and use the care you do in manufacture. Furthermore, it is not a permanent arrangement, and could conceivably work to the licensor's disadvantage in the future.

Question: In setting up a plant, should you start a new operation, or buy an existing company? Answer: There is a lot to be gained in buying an existing company and plant. Time can be saved in getting into operation. You have a going organization, and local prestige is already established.

Question: How about product, plant location and other geographical considerations? Answer: American-type machine tools should be built. Look for an economic setup where the highest percentage of sales lies, also locate on the basis of where necessary basic ma-

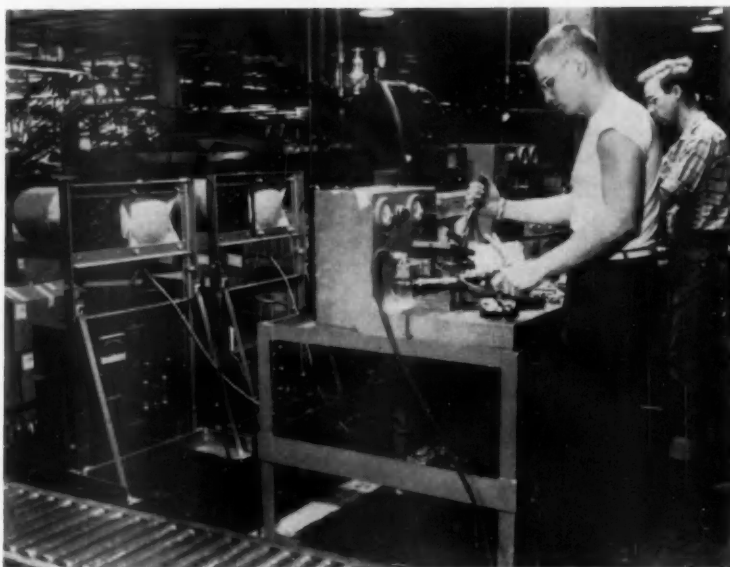
(Turn to page 136, please)

# Testing for Leaks in Air Suspension Systems

**A**UTOMOBILE manufacturers are using a new instrument to factory test the air suspension systems offered as optional equipment in some 1958 model cars. This is a leak detection system using as the tracer material nitrous oxide, a non-toxic and stable gas that is readily measured by a unique band in the infrared portion of the spectrum. This method of locating leaks involves the introduction of nitrous oxide into a closed system and the detection of its presence as the gas escapes from the system.

The new leak detection equipment shows within three seconds nitrous oxide concentrations as small as one part in one million parts of normal air. With this non-corrosive and non-toxic gas as the tell-tale material, dangers of contamination and explosion during operation are eliminated. High selectivity makes the detector practically insensitive to the usual stray gases and atmospheric contaminants present in high-production plants.

By manually moving a probe over the nitrous oxide pressurized



*The leak detectors (left) are used to check component parts of 1958 automobile air suspension systems before final assembly. After assembly, the air suspension systems are checked again with the instrument*

system, the operator is given both visible and audible indication of a leak. Variations in loudspeaker pitch and meter reading lead to the location of the leak point.

Leak detection inspection may even be automated.

This new testing equipment is manufactured by Perkin-Elmer Corp. of Norwalk, Conn.

## Automation Conference

### University of Chicago Holds Meeting to Discuss Relation of New Techniques to Long Range Planning

**W**ITH an attendance of about a hundred executives, the Automation, Operations Research, and Business Planning Conference of the University of Chicago met in Chicago April 21-22, to learn of the relation of new techniques to long range planning.

G. S. Knopf, of the Controls Section, Bendix Aviation Corp., speaking upon "Reducing Cost and Lead Time through Automation," warned that automation and numerical con-

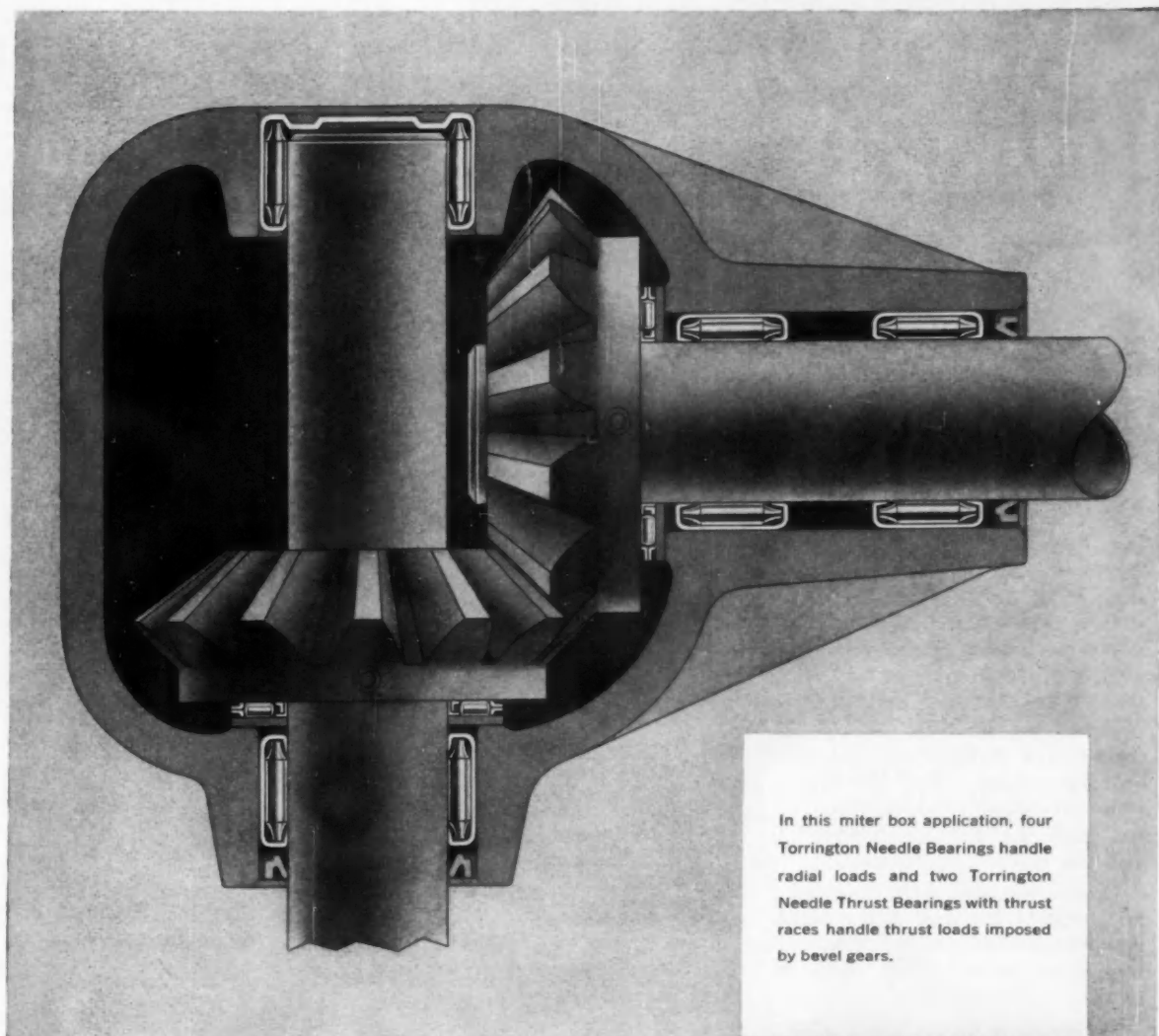
trol are not a cure-all. They will not correct designer's mistakes, and will not make a good part of faulty material. The dictating factors for tape controlled machine tools in each application will be improvements over conventional processing in their ability to: fabricate parts of complex design, previously not feasible; reduce setup and/or machining time; reduce tooling cost and lead time; obtain better finish or accuracy; provide better repeat-

ability; or increase versatility. Tape control applications to machine tools used mainly on short runs can simplify tooling and reduce setup time, he said. It holds much promise in the tool room also.

### Ford's Laboratory

Michael Ference, Jr., director of the scientific laboratory of the engineering staff at Ford Motor Co., stated that the technological activities of the industrial laboratory into basic research, applied research and development, tended to overlap. Working close to one another is largely responsible for the shortening in time between basic discovery and commercial product. It is now considered pertinent.

*(Turn to page 164, please)*



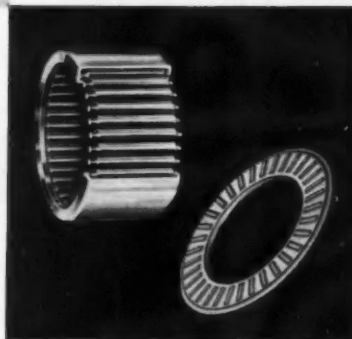
In this miter box application, four Torrington Needle Bearings handle radial loads and two Torrington Needle Thrust Bearings with thrust races handle thrust loads imposed by bevel gears.

## *Perfect Combination for Thrust and Radial Loads*

Here's a space-saving, cost-saving way to handle high thrust and radial loads. Just team up Torrington Needle Bearings with Torrington Needle Thrust Bearings!

With their full complement of small diameter rollers, Needle Bearings handle higher radial loads than any other anti-friction bearing of comparable cross section. And Needle Thrust Bearings are only .0781" thick — as thin as an ordinary thrust washer. Together they make a perfect combination of compact, light, rugged anti-friction bearings.

Either type of bearing may be run on hardened and ground adjacent parts to meet minimum space requirements. Or they may be used with standard races available from Torrington. To make the most of this efficient combination, call on our engineering staff for application advice. **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**



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# MIDLAND COMPRESSORS

*Are Your Best Buy  
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## **Compare Midland's Delivery Curve With That For Any Comparable Model And Prove It To Yourself!**

Because Midland Air Compressors have greater built-in efficiency, they deliver more air at any given speed than comparable models of other makes. And they require less horsepower to do so!

These performance charts of tests run in Midland's testing laboratories clearly show the rapid, ever-increasing air delivery curve for both the popular Model 7.4 and the heavy-duty Model 12.

Compare them with performance charts for any other make compressor and see for yourself how much better Midland Compressors perform.

In addition to delivering more air, these dependable compressors are lighter, run cooler, protect you against oil passage and carbon. See your nearest Midland Distributor or write the factory direct.

## **MIDLAND-ROSS CORPORATION**

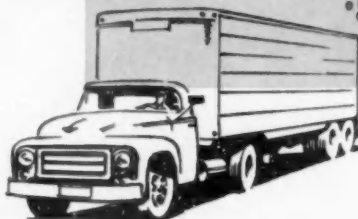
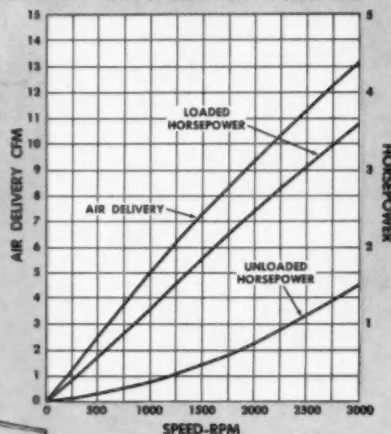
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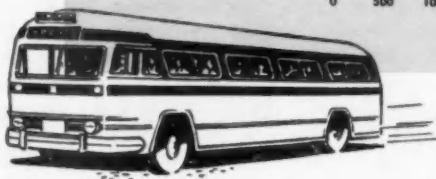
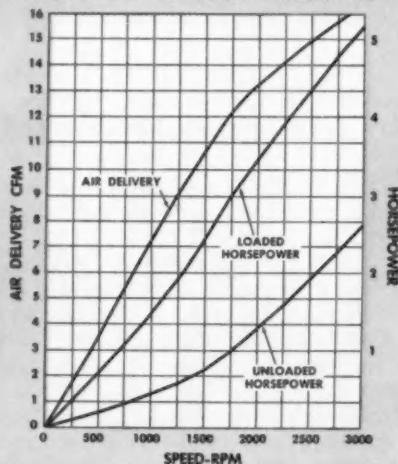
### **MIDLAND MODEL 7.4**

PERFORMANCE AT 100PSI DELIVERY PRESSURE



### **MIDLAND MODEL 12**

PERFORMANCE AT 100PSI DELIVERY PRESSURE



## Automatic transmission seal problem—

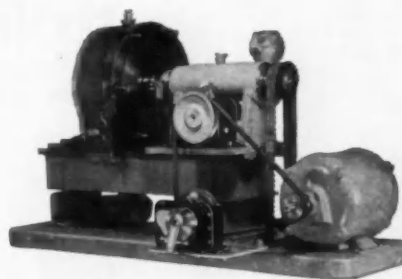


### New National Syntech® proves dependable answer in front pump seal position

Constant temperatures of 250°F, peaks of 300°, continual change in shaft speed, and total inaccessibility of the seal without costly teardown—these are a few of the sealing problems in the front pump of today's automatic transmissions for passenger cars.

To help meet this challenge, National engineers have produced a new oil seal. The new design, a steel encased, spring-loaded unit with Syntech synthetic sealing lip, is characterized by an unusually long flex section in the lip, a special, light-loading tension spring, and the time-tested, low torque Syntech lip itself.

Factory engineers report that the new National seals are proving extremely reliable in the application. Dealers also find the front pump seals are very reliable and do not require early replacement.



To design and thoroughly test the new seal, National engineers developed a new transmission simulator which exactly duplicates front pump operating conditions at all car speeds.



*Get real help on seal engineering problems. Call the National Engineer.*

**NATIONAL SEAL** Division, Federal-Mogul-Bower Bearings, Inc.

General Offices: Redwood City, California; Plants: Van Wert, Ohio, Downey and Redwood City, California

## Is Your Engine "Horsepower-Limited" by Tappet Face Stress?



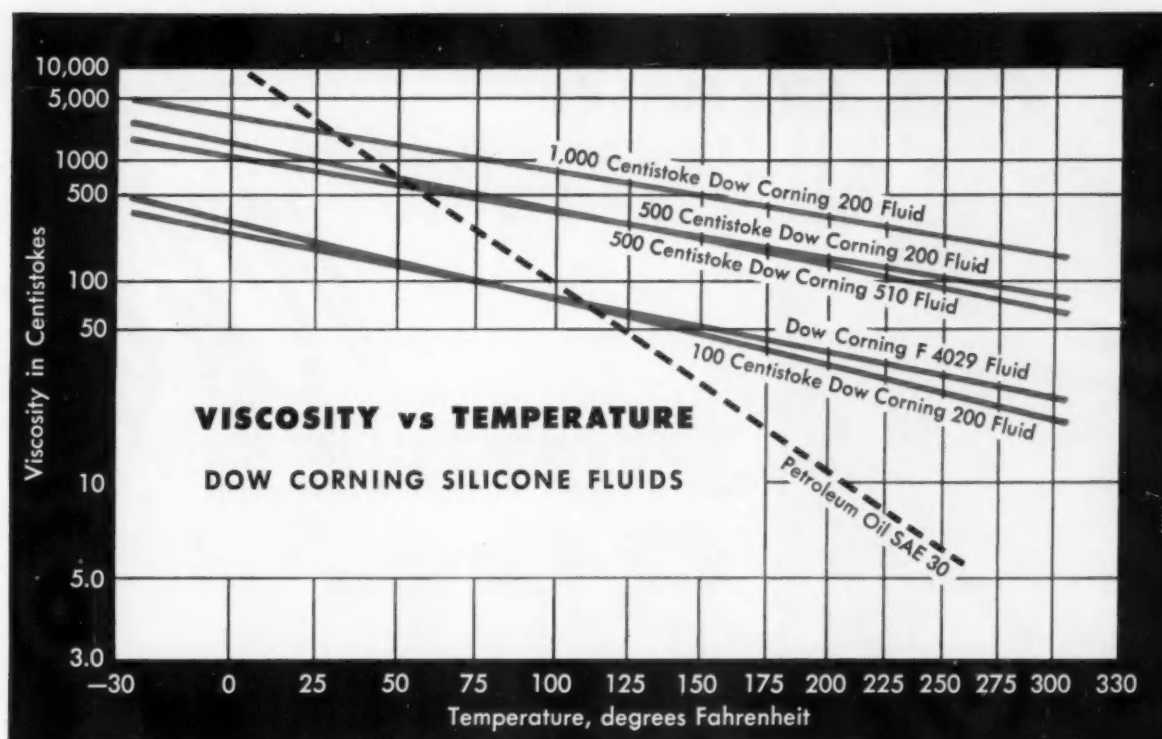
### Flat-Face Self-Aligning Tappets and Hydraulic Valve Lifters

The high cam lifts and heavy valve spring loads involved in developing higher horsepowers place increased stress on cams and tappets. Spherical face tappets make only limited-area contact with the cam, which frequently results in damaging wear or pitting. Flat-face tappets lower the unit stress, but their use has been limited by misalignment and deflection, which cause edge-riding. The Eaton self-aligning flat-face tappet permits full contact between cam and tappet to be maintained under all operating conditions.

Improve your engine by taking advantage of this new Eaton engineering development which has broken through the stress barrier. Call our engineers for a consultation.

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## Silicone Fluids MAINTAIN VISCOSITY

As the graph illustrates, Dow Corning silicone fluids are little affected by temperature changes. Their viscosity remains relatively constant over a wide span, whereas petroleum-base fluids thicken or thin out severely. In fact, Dow Corning Fluids are serviceable as low as -130 F and as high as 400 F.

### here's where silicone fluids help . . .

Dow Corning Fluids are highly effective as damping media. For example, dashboard indicator needle vibration is eliminated, and crankshaft torsional vibration is damped with silicone fluids. In such applications, silicone fluids resist oxidation, give uniform performance regardless of geographic location or season.

Silicones are also excellent fluid coupling media. They transmit torque consistently despite varying temperatures and are highly resistant to breakdown

due to shear. Silicone fluids are the transmission medium in such applications as the new auto engine fan hydraulic coupling.

A high degree of compressibility . . . up to 12% at 20,000 psi . . . in combination with their many other desirable properties, renders silicone fluids ideal for liquid springs or similar hydraulic devices. In other applications, silicone fluids serve as lubricants for rubber, plastics and certain metal combinations and as heat-stable dielectrics.

These are typical of the many automotive applications for Dow Corning silicone fluids. Send today for more complete information that will help you solve problems, improve designs. Dept. 065.



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# 4

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Pioneer 921-T Cast Aluminum Tooling Plate can be adapted to any precision tooling job without preliminary milling. Every Pioneer 921-T plate,  $\frac{3}{4}$ " or more in thickness, is held within a flatness tolerance of .010" in all directions. It is extremely stable, weighs 60-70% less than tool steel and possesses high tensile strength. The special aluminum-titanium alloy composition of Pioneer 921-T and method of casting insures uniformity, and guarantees freedom from porosity, distortion and casting defects. Being easily sawed, tapped, milled or welded, Pioneer 921-T is a universal tooling metal, saving material, time and man hours to reduce overall tooling costs.

At the left are shown a series of precision fixtures in which Pioneer 921-T was used in order to meet close tolerance requirements in the manufacture of a jet fuel component. Mail the coupon and receive free, all issues of TOOL TALK, presenting new and unusual applications of Pioneer 921-T.

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DEARBORN, MICH.: Pioneer Aluminum Inc.  
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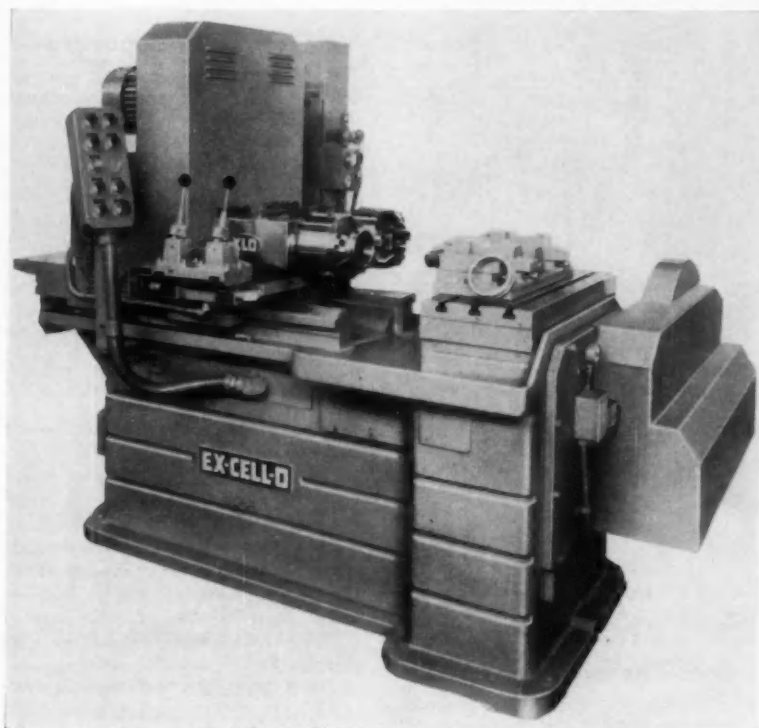
TOOLING PLATE  
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EXTRUSIONS

# NEW

# PRODUCTION and PLANT

# EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89



Ex-Cell-O cam boring machine contours automobile transmission races

## MachineContours Automobile Transmission Races

THIS two spindle, Style 312 cam boring machine performs similar operations on two parts simultaneously. Work includes precision facing, chamfering, turning, boring and two position grooving on steel components more than five inches in diameter.

On the cross slide two sets of tools, with four tools in each set, engage the parts during the machining cycle.

The first tool faces the front surface, chamfers the outside edge and turns the outside diameter. The second tool bores the inside diameter, holding limits of plus or minus 0.001 in. The third and fourth tools plunge the grooves. Three-jaw, air-operated chucks are used. Output is as high as 140 parts per hour. *Ex-Cell-O Corp.*

Circle 25 on postcard for more data

## Inclinable Presses

THE Torc-Pac line of open back inclinable presses features an air-friction clutch and brake as standard equipment. The clutch and brake plates are made of long-wearing sintered bronze and operate in an oil-bath at all times. Upon engagement,

oil is momentarily trapped between the plates. The oil molecules are crowded to a point where the oil itself begins to transmit the pickup load. Much of the pickup is accomplished before a metal-to-metal contact of the plates takes place. In this way a good deal of the wear that

friction linings are subject to never takes place.

Only six bolts need be removed to dismount the drive unit which consists of all working members of the drive and slide. The press features an all-steel welded frame and operating controls including four position selector switch and run and stop buttons are standard equipment. They are built in capacities of 22, 32, and 45 tons. *Clearing Machine Corp., Div. of U. S. Industries, Inc.*

Circle 26 on postcard for more data

## Adjustable Boring Bar

AN adjustable boring bar incorporating Kendex "throwaway" turnover inserts can be used in a wide range of boring operations because it was designed for greater ruggedness than conventional bars of adjustable head type. Any diameter between 2½ and 3¼ in. can be bored. Three heads, each with a half inch adjustment cover the range. The bar is of heat treated alloy steel. *Kennametal, Inc.*

Circle 27 on postcard for more data

## Dry-Type Power Center

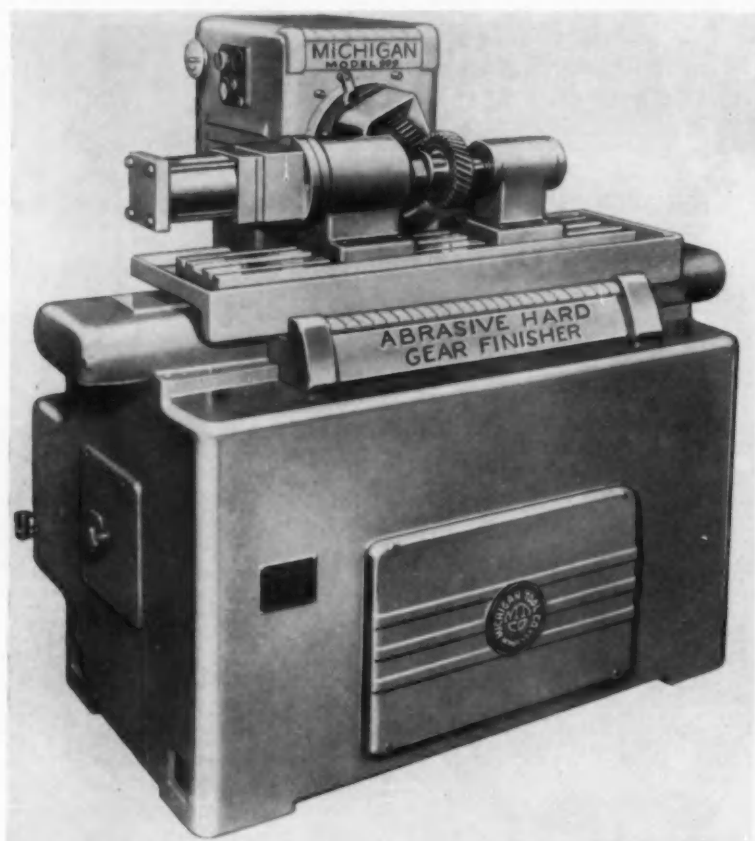
DRY-TYPE power centers, Type DT-3, are available in 5 and 2.5 kv classes for high voltage, and 600, 480, 240, and 120 volts on the low side. Three-phase power ratings are from 45 to 300 kva.

A main feature of the unit is the reduced space required due to revised arrangement of components and the use of the core and coils from the compact transformer. Unit length is 67 in. and the height has been reduced 15 in.

The low-voltage panelboard is in a separate section of the transformer compartment. Barriers prevent heated air from the transformer raising ambient temperature in the breaker compartment. *Westinghouse Electric Corp.*

Circle 28 on postcard for more data

## NEW PRODUCTION and PLANT EQUIPMENT



Michigan hard gear finishing machine cycle time is a little more than one minute

### Hard-Gear Finishing Process Uses Throwaway Tools

**A** GEAR-FINISHING machine, Model 999, finishes hardened small and medium sized gears up to 12 in. in diameter to quiet operating smoothness with abrasive throwaway tools.

The abrasive impregnated gear-like tool is rotated in tight mesh with and drives the work gear in a crossed axis relationship of about 25 degrees. Reciprocation of the table traverses the gear across the tool for the full face width of the gear. A constant pressure is maintained between the tool and the work to produce a tight mesh

finishing action. The throwaway tool is supplied in a 9¼-in. diameter size in face widths of 1 and 1½ in.

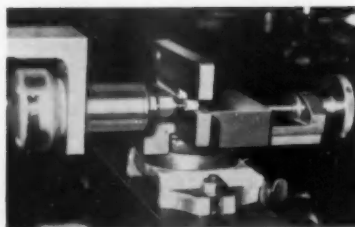
Model 999 is equipped with heavy-duty head and tailstock centers. Maximum length between centers is 24 in. The finishing tool mount is on an adjustable head supported by precision bearings and is outboard mounted. Weight of the unit is approximately 4000 lb and floor space required measures about 5 by 6½ ft. *Michigan Tool Co.*

Circle 29 on postcard for more data

### Air Turbine Grinder

**T**HE DIA-LH air turbine grinder is available with left hand rotation for mounting on milling machines or machine grinders. Typical applications of this high-speed grinder include slot and depth grinding, tool chip breaker grinding and cutter sharpening.

While operating at 50,000 rpm the



Onsrud air turbine grinding machine

air consumption rate is only 8 cfm. Its ¼ hp is ample for any work resistance with grinding wheels up to ½ in. diameter. The machine is built with pre-lubricated, grease shielded ball bearings pre-loaded to control end play to a 0.0002 in. tolerance. *Onsrud Machine Works, Inc.*

Circle 30 on postcard for more data

### Sheet Steel Separator

**M**AGNI-POWER separators are designed to separate steel sheets and blanks in preparation for feeding to presses, shears and related equipment. The units are enclosed in a stainless steel case for long wearing service and a fully welded construction is used throughout.

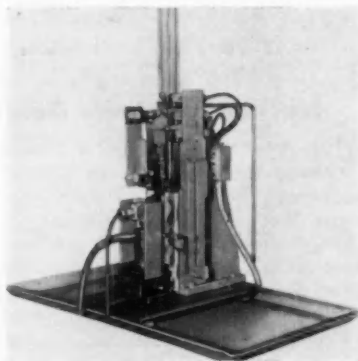
Vertical ribs on the magnetic surface offer low friction resistance and give one point contact. The top plate is extended and formed as a handle for easy grip. A full line of sizes and strengths is available. *Magni-Power Co.*

Circle 31 on postcard for more data

### Broaching Press

**T**HE Miles bench mounted broaching press will accommodate interchangeable broaches up to 2½ in. wide. It is capable of accuracies of 0.0002 in. and surface finishes to 10 microinches.

These machines are made in vari-



Ty Miles bench mounted broaching press

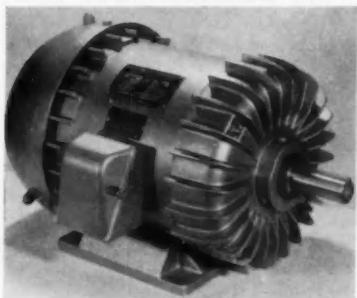
ous capacities ranging from 2000 to 6000 lb of force on the ram. Ram-stroke is from 6 to 24 in. and ram speeds are 20 to 60 fpm. Coolant tank and pump, control panel and switches are built into the base and the machine is all welded steel construction. Top is 20 by 40 in., with a lip all around. *Ty Miles, Inc.*

Circle 32 on postcard for more data

## Industrial Motors

**A** LINE of totally enclosed and explosion proof motors, from 1 to 500 hp, has been specifically designed for industrial applications. The motors are available in the new NEMA frames through 365U, old NEMA frames through 505, and standard industrial frames above 505 through 500 hp.

The line features recessed neoprene slingers on the output shaft, a fool-proof lubrication system, stainless steel connection and name plates, and



A. O. Smith motor for industrial applications

shock resistant fan covers. All models have indexed leads and a balanced insulation system. Overside conduit boxes are standard. *A. O. Smith Corp.*  
Circle 33 on postcard for more data

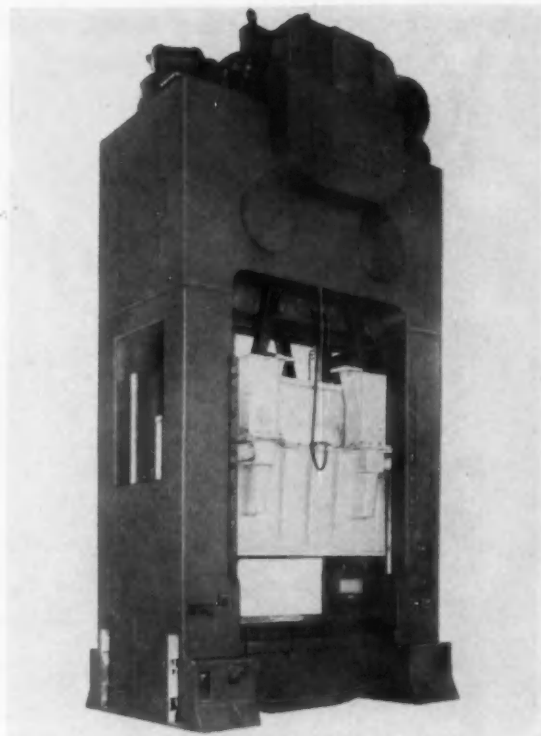
## Direct Writing System

**A** SPACE-SAVING packaging method is used for 6-channel Sanborn 150 series direct-writing oscillographic recording systems. A single vertical, mobile cabinet contains the Model 156-5466 basic assembly, comprised of six driver amplifier-power supply units and 6-channel recorder assembly. To complete the system, the user adds any of 12 interchangeable plug-in 150 preamplifiers.

The six power supply units occupy 42 in. of panel space above the recorder assembly. Overall dimensions of the cabinet are 78 in. high by 22 in. wide by 25 in. deep. Recorder location places the chart at a convenient height for viewing and making notations. The system also provides one per cent overall linearity; current feedback driver amplifiers and regulated power supplies for each channel; clear, inkless recordings in true rectangular coordinates by heated stylus on plastic-coated Permapaper charts; individual stylus heat controls; nine chart speeds from 0.25 to 100 mm/sec.; and choice of optional preamplifiers. *Sanborn Co.*

Circle 34 on postcard for more data

*Bliss enclosed straight side double action press is equipped with an in-built oil lubricating system. Plunger and blank-holder gibs, all slide adjusting mechanisms, flywheel and all linkages are included in the recirculating oil system. Flywheel, driveshaft, intermediate shafts, and all slide adjusting mechanisms are mounted on anti-friction bearings. Counter-balance cylinders are self-contained, and no surge tanks or surge piping are required. All presses can be furnished with rolling bolsters and with automatic die clamping on both plunger and blankholder slides to permit rapid die changing.*



## Enclosed Straight Side Double Action Press

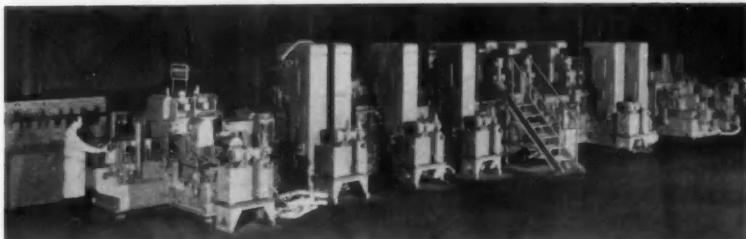
**E**NCLOSED straight side double action presses, designed to operate at high speed and maintain draw speed of 75 fpm, are available in capacities from 300 to 1600 tons. They are offered in J.I.C. sizes starting from 72 by 48 in. Featuring two or four point suspension on the inner ram, the presses are eccentric gear driven throughout all sizes.

These presses may also be equipped

with electronic press drive which permits reverse jogging of a press without stopping and reversing the motor. In addition, a servo system controls clutching and braking, electronically compensating for heat and pressure variations. The drive also permits a rapid advance to the work, a compensated automatic slow down and a fast return. *E. W. Bliss Co.*

Circle 35 on postcard for more data

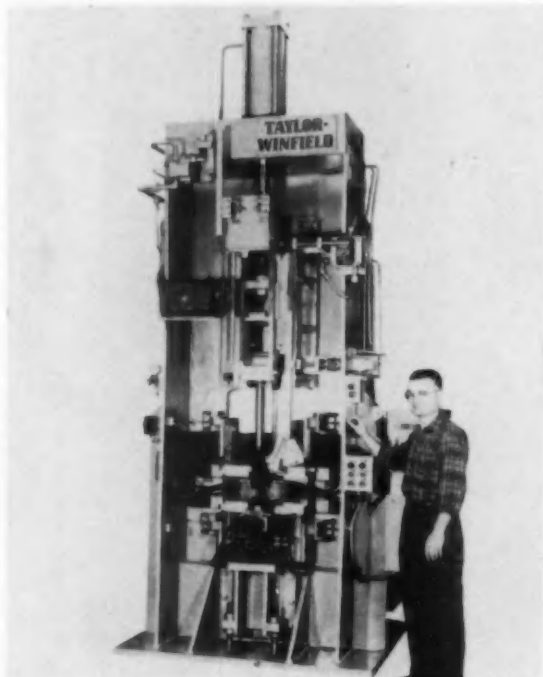
## Multi-Operation Machine Regulated By Static Controls



Thirty-six station Economatic developed from standardized building-block components machines aluminum die-cast automobile transmission extensions. The machine bores, faces, drills, reams, taps, chamfers, spin-faces, gages, and also assembles a bushing into the workpiece under regulation of static-control elements. Workpieces are carried on a walking beam transfer mechanism through the 85 ft long machine. Each movement is 24 in., the distance between stations. (*Buhr Machine Tool Co.*)

Circle 36 on postcard for more data

## Vertical Hot Upsetting And Gathering Machine



As a preliminary operation for forging blades for jet engines, bulbs of metal are formed at one end of rods by this 150 kva vertical hot upsetting and gathering machine. It handles  $\frac{5}{8}$  to 1-5/16 in. diameter aluminum bar stock,  $\frac{5}{8}$  to 1 1/2 in. diameter stainless steel rod and  $\frac{5}{8}$  to 1-3/32 in. titanium rod. A pair of laterally acting electrodes clamp the work piece and a pressure ram forces the piece in contact with the lower electrode. The lateral electrodes change elevation to control the contour of the bulb end. The machine is hydraulically operated with full sequence control of upset pressure, electrode die space and electrical power input. (The Taylor-Winfield Corp.)

Circle 37 on postcard for more data

from 4 by 8 ft to 6 by 16 ft. All screens are equipped with a snubbing device that limits motion during acceleration and deceleration and automatically eliminates critical vibration in the resonance speed range. Link-Belt Co.

Circle 38 on postcard for more data

## Diesel Engine

THE MB 820Bb Mercedes-Benz Diesel engine is made in the 625 to 1025 hp range from 1000 to 1500 rpm. It is a 12 cylinder, V-type,

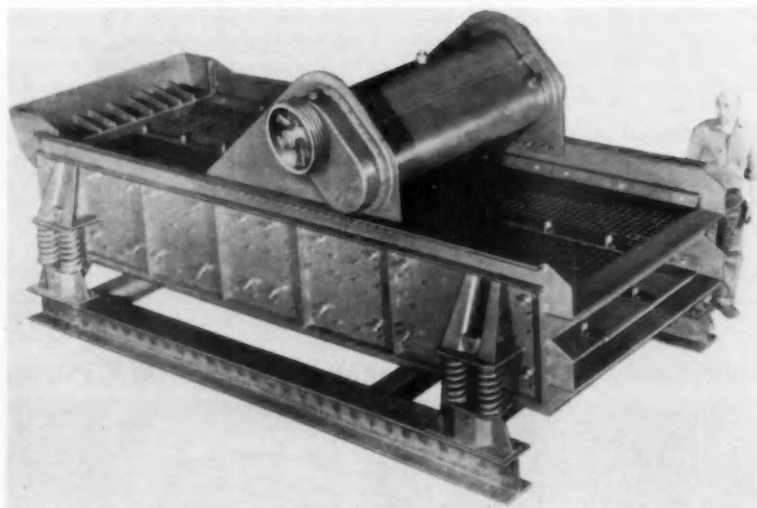


MB 820Bb turbocharged Diesel engine

vertical, four cycle, liquid cooled turbocharged engine with a compression ratio of 16 to 1. Weight is 6116 lb and overall dimensions are 94 1/2 in. long, 53 in. wide and 77 in. high.

Glow plugs are provided to give fast, dependable starting. Aluminum alloy is used for the cylinder block, pistons and oil pan. The engine is suitable for large pumps, generator sets and heavy construction machinery. Curtiss-Wright Corp.

Circle 39 on postcard for more data



Link-Belt heavy-duty Straightline horizontal vibrating screen, CL Model 58

## Heavy-Duty Vibrating Machine Dewater, Washes, Sizes

A HEAVY-DUTY Straightline horizontal vibrating screen, CL-Model 58, has been designed for dewatering, washing and sizing a wide variety of materials. It can be cable suspended or floor mounted. Where conditions warrant, a combination of both mountings can be used.

The machine achieves a high intensity motion by centrifugal force, unbalanced shaft vibrators. Two eccentric shafts in the vibrator are rotated by a helical gear speed reducer, giving the screen its straightline motion. The machines are made with single or double decks in 15 sizes ranging

## Melting-Holding Furnace

COMBINATION melting-holding furnaces in capacity sizes from 1200 to 1500 lb may be used for die casting, permanent mold casting or sand casting of aluminum. They are gas fired and automatic temperature controlled.

Rejects and back scrap can be charged back on the sloping hearth, eliminating any contamination of the inside of the furnace with inserts. Melt loss is reduced by a deep bath and radiant roof heating. Sunbeam Corp.

Circle 40 on postcard for more data

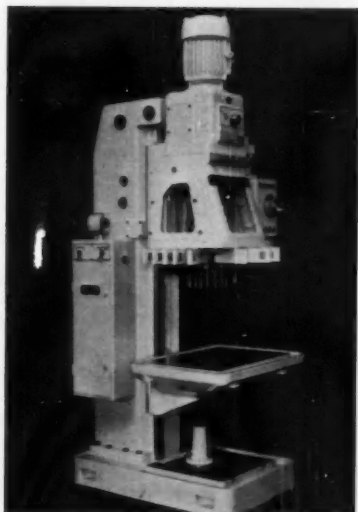
## Micro-Adapters

A LINE of precision Rigidcut milling cutter micro-adapters eliminates the need for adjustable milling machine spindles when the adapters are specified as original machine tooling. With normal face-milling cutter wear up to 0.020 in., the adjustable adapters permit four regrinds before blades must be reset. Adapter adjustments are made in the toolroom at the time of grinding so that machine down time is minimized. Adapter-cutter blade concentricity is held to a total indicated runout of 0.0005 in. Standard adapters are available in five sizes for use with milling cutters ranging from 4½ to 12 in. OD. Wesson Co.

Circle 41 on postcard for more data

## Multi-Spindle Unit

THIS drilling and tapping machine can carry a maximum of 12 spindles. The spindle carrier is designed in the unit system and enables a multitude of spindle units to be combined in any position around an indexing table and thus obtain a semi-automatic drilling and tapping machine for many operations. The machine is equipped with a hydraulic self-contained unit operating the vertical feed of the whole unit. It can also be equipped with a separate



Multi-spindle drilling and tapping unit

tapping slide permitting the threading of various pitch threads within the range of the machine. Eric R. Bachmann Co.

Circle 42 on postcard for more data

## Surface Grinding Machine Features 1 HP Spindle Drive

The No. 510 surface grinding machine grinds work to 11 in. long, 5¼ in. wide and 12¼ in. high with an 8 in. diameter wheel. The spindle is the removable unit type. The table glides on ground and precision lapped rollers traversed by a hand-operated lever. An adjustable drag is provided. The unit is equipped with a one-shot lubrication system. Weight is approximately 1225 lb and it requires a space of 47 by 55½ in. Spindle drive is from a 1 hp motor. Available equipment includes magnetic chucks, an exhaust attachment, a wet grinding attachment, 4¾ in. index centers, continuous radius and tangent wheel truing attachment and a high speed surface grinding attachment. (Brown & Sharpe Mfg. Co.)

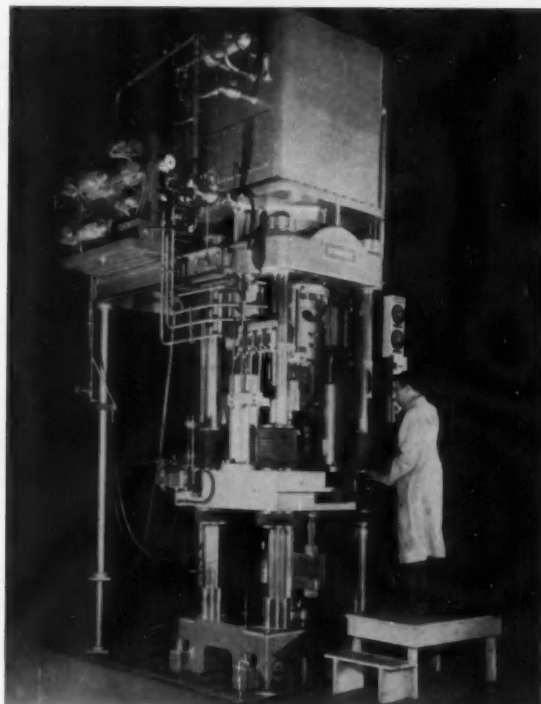
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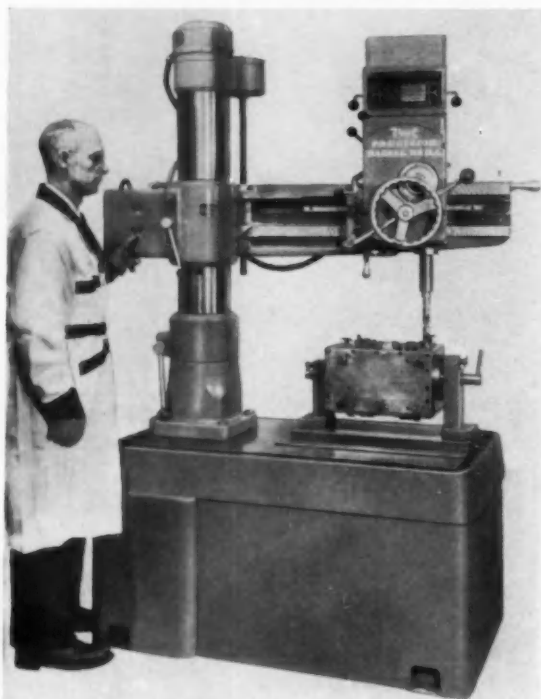
## 100-500 Ton Hydraulic Compacting Presses

A series of hydraulic powder metal compacting presses, Model 714, offers units with pressing capacities of 100, 200, 300 and 500 tons. Shown is the 300 ton capacity model. They are basically single-acting presses with a single upper punch motion delivering the pressure by means of the downward stroke of the hydraulic ram, and a die table which provides upward resistance to the motion of the upper punch. The bottom punch is fixed. The depth of fill is adjusted by means of threaded nuts on two of the main tie rods. The press can be operated manually, semi-automatically or automatically. The hydraulic power unit is placed above the main portion of the press to reduce floor space requirements. (F. J. Stokes Corp.)

Circle 44 on postcard for more data



### Precision 3 Foot Radial Drill



The Veet precision 3 ft radial drill has a working height of 26 in. Features of the drill include a score-proof nickel-moly alloy column, hardened way inserts on the head and arm, and quick action clutching. Drive gears have been widened to carry more load and 16 spindle speeds are provided with four power feeds geared to the spindle speeds. The boring type quill, 3 3/8 in. in diameter, is hardened and lap-fitted to the head providing accuracy for jigless spacer-table boring. All models are service designed to permit easy removal of the head, transmission, drive unit or elevation gear box for servicing or repair. (Veet Industries)

Circle 45 on postcard for more data

rate of 200 parts per hour. A 63 in. index table holds 12 work fixtures with power clamping and automatic unclamping.

Nine vertical units on the center column operate 25 tools on nine holes. Twelve horizontal units on knees operate on eight holes from three directions. Three units are radial, three are 20 degrees right of the radial lines and six are 20 degrees left of these lines. Bushings guide 36 of the 40 tools. The JIC electrical controls are housed in a separate cabinet. If any operating unit fails to complete its cycle, its identifying light flashes on a panel and the machine will not index until the trouble is corrected. Kingsbury Machine Tool Corp.

Circle 46 on postcard for more data

### Tumble-Barrel Finisher

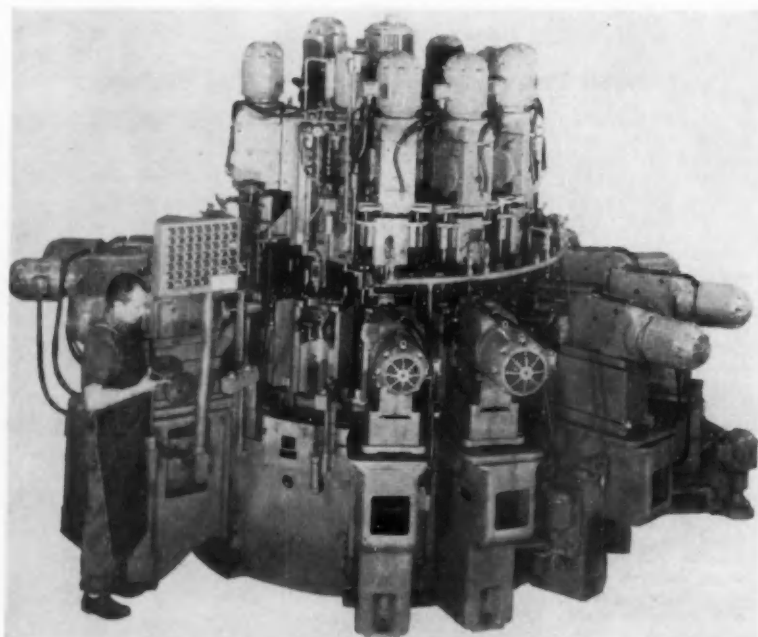
MANY different finishing operations and a wide range of products can be handled with the Model V4 and V6 precision barrel finishers. The



Rampe tumble-barrel parts finisher

machines have 4 and 6 cu-ft barrels with 2 or 3 interchangeable compartments respectively. Both models have 23 rpm fixed speed drive, or an optional 12 to 36 rpm variable speed drive. The semi-enclosed cabinet design gives adequate protection and rigidity. All welded construction is used, with heavy-duty self-aligning ball-bearing pillow blocks to withstand steelball burnishing loads and continuous production runs. Rampe Mfg. Co.

Circle 47 on postcard for more data



Kingsbury multi-unit automatic machines pump body castings for transmissions

### Multi-Unit Automatic Machines Pump Body Castings

THE Kingsbury Multi-Unit automatic machines pump body castings for automatic transmissions.

Twenty-one units with 40 spindles end mill, drill, counterbore, spotface, chamfer, ream and tap at a gross

### Insert Milling Cutters

POSITIVE rake inserted blade shell end mills and face mills, utilizing 1/2 and 3/4 in. square throwaway carbide and high-speed inserts, are being

produced with positive radial and positive axial rake angles. A hardened high-speed steel anvil is located in back of, and under the cutting insert. The anvil is fastened to the



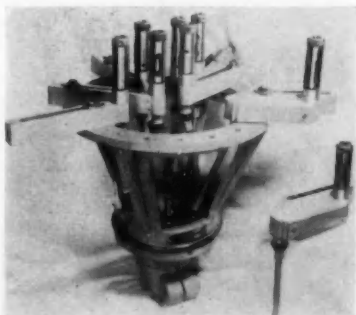
*Viking throwaway insert milling cutters*

cutter body by a retaining screw, to prevent disassembly during indexing or replacement of the insert or blade. A dual threaded screw actuated wedge provides easy insert indexing. Generous chip room is provided along with close blade spacing for high feed rates. *The Viking Tool Co.*

Circle 48 on postcard for more data

### Spindle Bracket Assembly

**A**n extension spindle bracket assembly for use with the full line of Thriftmaster universal joint type drillheads provides a 4½ in. extension of the maximum adjustment and permits drilling under and beyond



*Thriftmaster extension spindle bracket*

the flange of the drillhead body. Full ball bearing completely enclosed gear driven construction insures dependable operation at the same maximum speed and capacity as the standard spindle bracket assemblies. They are precision machined for use with jig bored spindle locating templates. *Thriftmaster Products Corp.*

Circle 49 on postcard for more data

## Hydraulic Bending Machine For Bending Steel Bar Stock

*Richards hydraulic bending machine is supplied with 26 dies to include 9 female dovetail units, 6 male dovetail units, 11 mandrel dies, 4 of which are formed and seven are round. Combinations can be made by using male or female dovetail dies in the male or female mandrel dies to obtain various bend shapes. The machine measures 17 by 28 by 42 in.*



**T**HE No. 6 hydraulic bending machine has a bending capacity to 7000 lb at the bending tools. The hydraulic pump is controlled by a thumb-operated switch and is driven by a 1½ hp, 110 v universal motor. Forward or reverse action is obtained by depressing or raising the control handle. An adjustable hand lever, at the rear, positions the dies for correct gap to match a given material

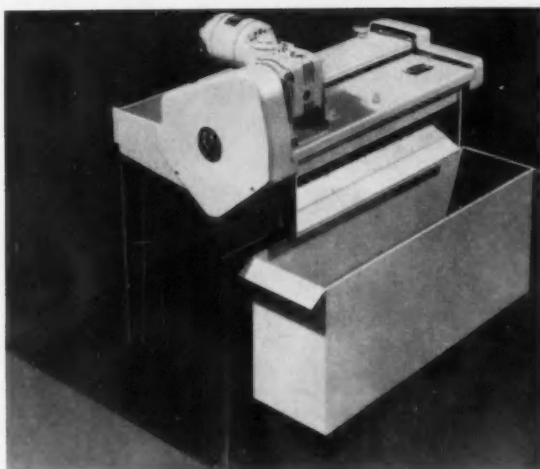
thickness or for various radii without need for die change within the limits of the dies being used. Construction includes a hardened and ground 1 in. surface plate measuring 12 by 11 in. and hardened dovetail die ways. Maximum opening is 4 in. Stroke is 1½ in. Minimum closing between the heads is 2 in. *J. A. Richards Co.*

Circle 50 on postcard for more data

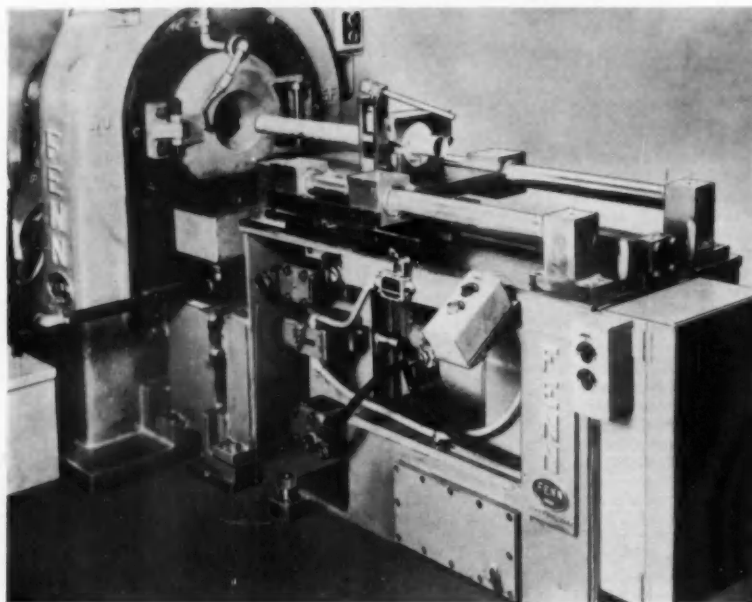
## New Line Of Magnetic Coolant Separators

*Power-Grip magnetic coolant separators offer automatic coolant cleaning and can be easily installed on many types of grinding, honing and gear-shaving machines. Coolant leaving the machine passes under the solid, permanently charged revolving drum for direct exposure to the magnetic drum without interference from nonmagnetic insulators. Separated material is removed mechanically. (Sundstrand Machine Tool Co.)*

Circle 51 on postcard for more data



## Hydraulically Operated Swaging Machine



The Model 5F Swaging Machine, equipped with a No. 40 feed, will point 3 in. diameter by 1/32 in. wall steel tubing down to 1 1/2 in. diameter in a single pass. The special feed operates hydraulically but has a manually operated work piece gripper. (The Fenn Mfg. Co.)

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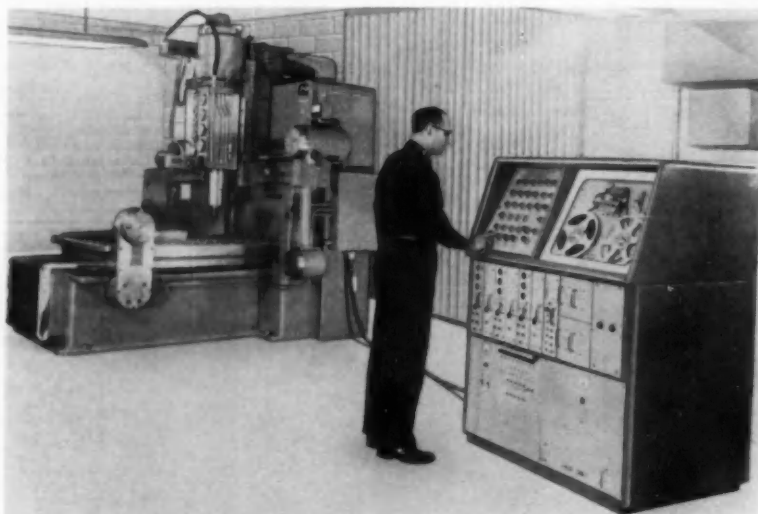
100 ipm are available, with tolerances down to 0.001 in. The machine is also equipped with micro-dials for positioning and push-buttons which enable the operator to use it as a conventional milling machine.

Using half-inch magnetic tape operating at a speed of 7 1/2 ips, a full hour of machining can be accommodated on a 2400 in. roll of tape, which constitutes a full tooling record. The 30 hp spindle, with speeds variable from 20 to 3600 rpm, provides a wide range of control suitable for machining heat-treated steels as well as the softer metals and alloys such as aluminum and magnesium. Other design features which Morey has included are anti-friction mounting of all components, roller-bearing saddle and table mounting, recirculating precision ball-nut lead screws and anti-backlash hardened ground gears throughout. *Electronic Control Systems, Div. of Stromberg-Carlson Co.*

Circle 53 on postcard for more data

## Versatile Radial Drill

LARGE drilling and tapping capacities are the main features of the Donau DB 25 radial drill. A single



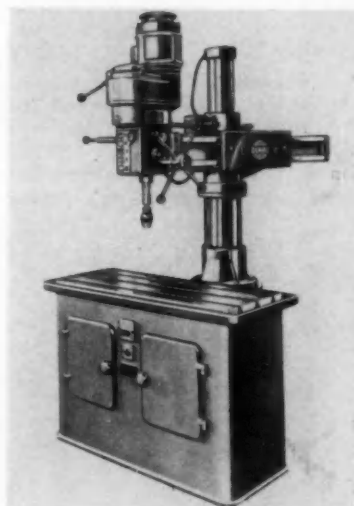
Stromberg-Carlson Digimatic control system used with Morey Model A-50 machine tool

## Machine Tool Features True-Circle Cutting

THE Morey A-50 machine tool, utilizing the Stromberg-Carlson Digimatic numerical control system, offers true-circle cutting and keyboard programming in a complete system.

The control system occupies less than 12 sq-ft of space, yet has the

capability to run the 4 by 4 ft bed-type machine, including its heavy-duty 30 hp spindle. Self-checking features and modular design packaging principles make the control console simple to use and maintain under tape control. Cutting speeds up to



Cosa Corp. Donau DB 25 radial drill

lever controls both horizontal and radial displacement and all clamping operations. Four different speed ranges cover speeds from 60 to 1700 rpm. A two speed motor provides a speed ratio of up to 16 to 1 within each speed range. Drilling capacity into solid steel is one in. Tapping power in steel is 1/2 in. Power required is 1 1/3 hp. *Cosa Corp.*

Circle 54 on postcard for more data

## Precision Bench Shaper

**A**N improved 7-in. stroke precision bench shaper has been equipped with an automatic pressure lubrication system for smooth operation at high speeds. A cam-operated piston pump circulates lubricating oil from a large reservoir to all important bearing surfaces. Oil pressure is adjustable and can be maintained at all speeds.

Length of ram stroke is adjustable 0 to 7 in. Stroke rates range from 42 to 195 fpm and cutting speeds from 3 to 114 fpm. The tool head has a 3-in. feed and swivels to any angle. The work table is 6 5/16 in. long, 5 in. wide and 5 1/2 in. deep. Vertical travel of table is 5 in. Power cross feeds range from 0.002 to 0.012 in. with 9 1/2 in. maximum travel. Slots and holes are provided on the top and both sides of the table for clamping the work fixtures or the vise. *South Bend Lathe Works.*

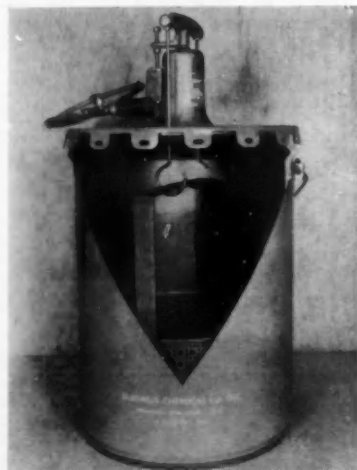
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## Air Powered Part Cleaner

**T**HE Mini-Dip air powered parts cleaner is a bench type cleaning machine with a built in air motor. It fits the top of any standard 5, 6 or 15 gallon open head container.

The unit will handle up to 50 lb of parts at a time. After mounting the unit to the container cover and connecting to the air supply, a turn of the air valve automatically agitates the basket of parts up and down 100 times a minute through the cleaning solution. *Equipment Div., Magnus Chemical Co.*

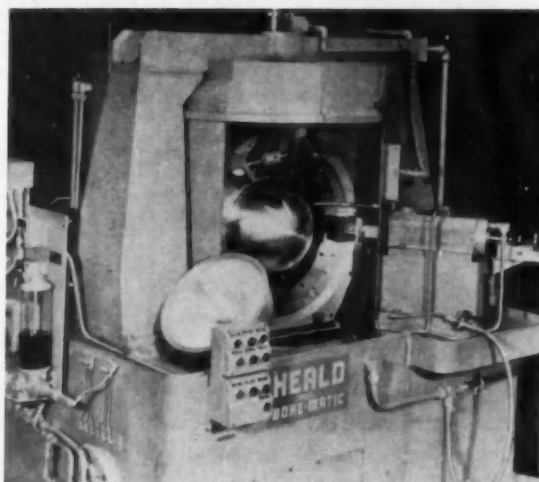
Circle 56 on postcard for more data



Magnus Mini-Dip parts cleaner

## Aluminum Hemisphere ID-OD Bored, Turned Together

*Heald Model S Bore-Matic simultaneously bores and turns the ID and OD of aluminum hemispheres. Uniform concentricity between inner and outer surfaces is maintained, and because the inner and outer tool pressure equalize each other, a heavy cut can be taken without distorting the shape of the relatively thin walled part.*



**S**IMULTANEOUS spherical boring and turning of the ID and OD of large aluminum hemispheres can be accomplished on the Model S Bore-Matic.

Work is loaded and clamped in position, located by a recessed flange in the fixture. A push button starts rotation of work and feeds the two tool bars into the cut. When tooling reaches pre-set depth of cut, the turntable is automatically started, pivoting the rotating fixture and gen-

erating the spherical faces of both ID and OD simultaneously. At the end of 90-degree turntable rotation, the boring bars are retracted and the fixture returns to loading position.

Size tolerance is held to  $\pm 0.0005$  in. on ID and OD to maintain uniform wall thickness. A dial indicator on a pivoted arm permits accurate checking of finish size before removing the work from the machine. *The Heald Machine Co.*

Circle 57 on postcard for more data

## Rapid Boring Unit For Machining Steel Forgings

*The LeBlond-Carlstedt Rapid Borer, in five operations, finish bores steel parts accurate to  $\pm 0.001$  on length and concentricity, and 25 to 30 microinches on finish. A typical operation calls for solid boring a 5/8 in. diameter hole, counterboring a 1 in. diameter, solidboring a 1 in. hole and radius forming. Feeds of 5/32 and 8 ipm are used. The part is 14 1/8 in. long, 4130 steel Rockwell 39 to 43 C. There is only one setup and cycling is automatic. It handles work that is symmetrical for balance in rotation; round, square, octagonal, tapered or stepped. (The R. K. LeBlond Machine Tool Co.)*

Circle 58 on postcard for more data

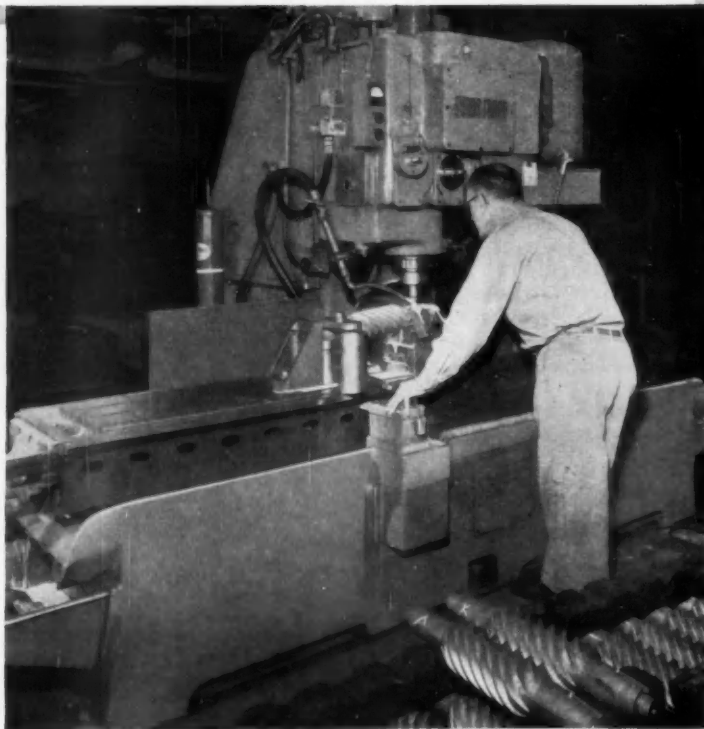


# Keyway Milling Time On Worm Shafts Cut 22% With A Sundstrand Rigidmil

Production milling of keyways for worm shafts at Cleveland Worm & Gear Company on this Sundstrand Rigidmil results in time savings on quantity runs averaging between 20 and 25 per cent compared with former methods. On the job illustrated, for example, cycle time is down to 8½ minutes from 11 minutes formerly taken. The extreme flexibility of operations possible with Rigidmils also permits a wider range of parts to be handled.

If your operation calls for precision combined with relatively high volume like this setup at Cleveland Worm & Gear, you will find that there is a Rigidmil available with the right combination of speed ranges, horsepower, table, etc., to suit your needs. You don't have to sacrifice important features to get some of those you want most, nor do you have to get a milling machine that is custom designed and built at a price that goes out of sight.

See for yourself what you can get in advanced design milling machines today by looking over the line of Sundstrand C-Model Rigidmils. They're available in simplex or duplex



Sundstrand Rigidmil at Cleveland Worm & Gear Co. mills key-ways in various sizes of worm shafts.

types, with 7½ to 75 hp, 3 to 14 ft. table strokes, 14 to 38 in. table widths and with tracer controls for milling aluminum or steel.

Write for Bulletin 291 describing the complete C-Model Rigidmil line.



## SUNDSTRAND MACHINE TOOL CO.

2571 ELEVENTH ST., ROCKFORD, ILLINOIS



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## FREE LITERATURE

### Industrial Tubes 1

Booklet 86-020A, 20 pages, includes new sections on camera tubes and radiation detection tubes and similar equipment having many industrial applications. *Westinghouse Electric Corp.*

### Self-Sealing Fastener 2

A four page circular describes Lok-Thred self-sealing fasteners, said to be ideally suited as a fastener in modern light metal engines and parts. *Lock Thread Corp.*

### Automatic Lathes 3

Bulletin Q-57 describes the Model Q double-way, tracer type automatic lathes designed to combine rough and finish turning operations on a single machine. *Seneca Falls Machine Co.*

### Deep Throat Press Line 4

Bulletin 5, four pages, illustrates a line of deep throat, high speed presses. Dimensions and capacities of eight bench and floor model presses are included. *E. W. Bliss Co.*

### Vacuum Arc Furnaces 5

Bulletin GED-3599, eight pages, describes the principle used in designing vacuum arc melting furnaces and discusses components, controls and instrumentation. A cutaway view illustrates key features of the furnace. *General Electric Co.*

### Motor Couplings 6

Folder 2875 details pertinent application and selection data for a line of couplings designed for use as motor couplings for transmitting electric motor power to pumps, generators, speed reducers and similar equipment. *Link-Belt Co.*

### Carbide Toolholders 7

Catalog 542, 12 pages, covers T-Max throwaway type carbide toolholders and lists the various sizes available. *Sandvik Steel, Inc.*

### Service Facilities 8

An 80 page book listing details of research and development, engineering, manufacturing and service facilities is available from *Janitrol Aircraft Div., Surface Combustion Corp.*

### Glass Catalog 9

Catalog 80-23 discusses fabrication, materials, tolerances and applications of precision glass products for many industrial applications. *Fischer & Porter Co.*

### Hardness Tester 10

A two page data sheet designated TT-58 describes the Model TT Rockwell TwinTester which was designed for use in laboratories, tool departments, metal jobber shops, etc. *American Chain & Cable Co., Inc.*

(Please turn page)

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## Analog Computer 11

An eight page brochure describes the Model MC-400 desk-side analog computer which has been designed to meet the need for high precision analog computational facilities at minimum cost. *Mid-Century Instrumatic Corp.*

## Ductile Iron Bulletin 12

A 12 page bulletin presents information on ductile iron. Bulletin 1102 shows how patterns and molds are made, how castings are machined and finished, and some of the end products. *T. B. Wood's Sons Co.*

## Gasoline Engines 13

Two revised two page bulletins describing two-cylinder and four-cylinder Hercules air-cooled engines have been issued by *Hercules Motors Corp.*

## Window Units 14

Window units designed for visual observation of oil supply and operation of internal machine parts are described and illustrated in four page Bulletin 8-E. *Bijur Lubricating Corp.*

## Magnets, Magnetizers 15

Catalog PR-19 describes stock permanent magnets, magnetizers and demagnetizers used in aircraft, guided missiles, electronic products, electronics, automation, automotive and instrumentation devices. *The Indiana Steel Products Co.*

## Flame Hardened Rolls 16

A catalog on flame hardened rolls includes an engineering chart with ranges for hardness and depth, illustrations demonstrating the sizes and kinds of rolls for such industries as steel and rubber and types of materials handled. *Detroit Flame Hardening Co.*

## Selective Speed Drives 17

Bulletin 11-1 Pl, eight pages, covers a line of selective speed drives, what they do and how they are applied. *Century Electric Co.*

## Solenoid Valves 18

Prices, valve ratings, flow diagrams, illustrations and engineering data of a line of solenoid valves are presented in an eight page catalog prepared by *The Automatic Switch Co.*

## Centrifugal Fan 19

Bulletin BB-105 covers a complete line of backward-blade fans designed for use in heating-ventilating and air conditioning systems and various industrial processes. *General Blower Co.*

## Vibrating Feeders 20

A line of air operated vibrating feeders is covered in Bulletin 1000. The feeders will handle materials from 0 oz per hour to maximum poundage by changing operating air pressure. *The Cleveland Vibrator Co.*

## Parts Feeder Catalog 21

Syntron Co. has published a 16 page catalog on vibratory parts feeders and parts feeder components. Data on parts feeder supply hoppers, bowl level limit switches, gravity-feed tracks, and electronic and mechanical escapement and counting devices is included.

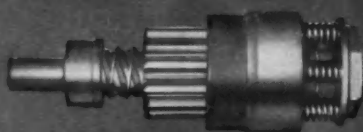
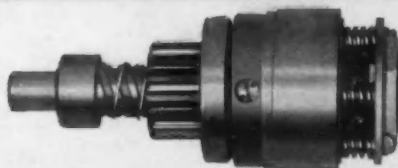
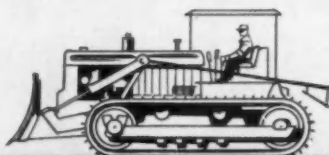
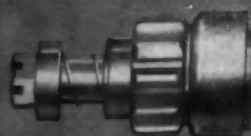
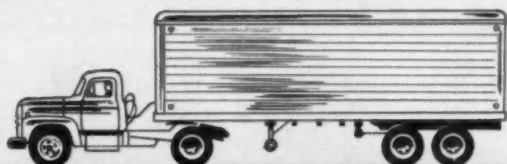
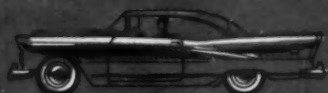
## Switching Circuits 22

"High Speed Switching Circuits," is the title of an application booklet which gives detailed information on high speed electronic switching used for missile computers, ground control computers and industrial computers. *Hoffman Electronics Corp.*

## Flexible Tubing

A 36-page technical data booklet covers all types of flexible tubing and hose, together with many types of couplings which can be used with the tubing. Address request on company letterhead to *Dept. 1, Pennsylvania Flexible Metallic Tubing Co., 7200 Powers Lane, Phila. 43, Pa.*

USE THIS POSTCARD



## BIG OR SMALL . . . BENDIX DRIVES START THEM ALL

Throughout the world of transportation it's an accepted fact that *you start with Bendix!* And it's not surprising. Bendix\* Starter Drives have been synonymous with dependability for fifty years in the automotive field. They've proved themselves just as reliable on submarines, aircraft, earth movers, outboard motors, helicopters. In fact, every type of internal-combustion

engine ever built has used a Bendix Starter Drive. Hospitals use Bendix Drives to activate their stand-by equipment. Air raid sirens across the country are started with Bendix Drives. It's logical to believe that such universal acceptance indicates a standard of quality which no other manufacturer has been able to match. Need we say more?

\*REG. U. S. PAT. OFF.

**Bendix-Elmira, N.Y.**

ECLIPSE MACHINE DIVISION



# NEW

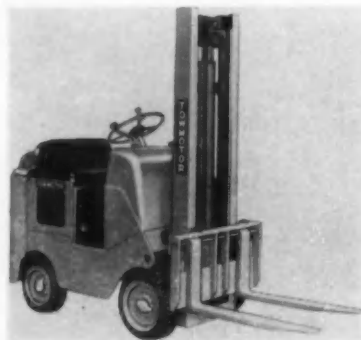
# PRODUCTS

## AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

### Industrial Trucks

Eleven models of fork lift trucks have been developed for use in industries and areas where added safeguards are required for fuel, electrical and exhaust systems. An exhaust system that features a dry type muffler and special spark and flame arresting



tailpipe are used. The exhaust system consists of perforated tailpipe extension across the back face of the radiator. The exhaust is directed against the radiator fins into the discharge air stream so as to dissipate spark and flames in the event of possible backfire.

Other safety features include an extra-rigid fuel tank, safety filler cap and a non-conductive battery cover plate. An automatic shut-off valve stops the fuel flow if the engine stalls or is shut off. A master disconnect switch for the entire electrical system is located within easy reach of the lift truck operator. *Towmotor Corp.*

Circle 80 on postcard for more data

### Capacitor Motors

A line of heavy-duty capacitor-start induction-run single phase integral hp motor is designed to provide high starting torque and operating efficiency. They incorporate features to insure trouble-free operation under severe operating conditions.

For starting, the motors use capacitors of the dry electrolytic type

designed for maximum starting torque with minimum current usage. When the motor gains speed, a centrifugal switch cuts out the capacitors for straight induction run. They are easy to reach through the access cover and can be replaced without disturbing the centrifugal actuating mechanism or any other part of the motor.

These motors are suited for service with: pumps, fans, drill presses, lathes, sanders, circular saws, and similar equipment. Type WCZK single-phase 60-cycle, 115/230 v motors are available from  $\frac{1}{4}$  hp to  $1\frac{1}{2}$  hp at 1200 rpm, 1 hp to 3 hp at 1800 rpm, and  $1\frac{1}{2}$  hp at 3600 rpm. *Fairbanks-Morse & Co.*

Circle 81 on postcard for more data

### Dual Speed Governor

Developed for a line of permanent magnet dc motors, a speed governor can provide two regulated speeds within the speed capacity of the motor with which it is used. This range is generally about 4000 to 15,000 rpm. Each speed can be set by a separate adjusting screw.

The governor is designed to fit inside the  $1\frac{1}{4}$  in. OD cover which en-



closes the motor, and adds about  $\frac{5}{8}$  in. to the motor length. *Globe Industries, Inc.*

Circle 82 on postcard for more data

### Air-Water Remover

A large capacity air filter and water separator removes all dirt, scale and moisture from both line air and regulated air for paint spray operations.

Features include two regulated air valves that permit use of two spray



guns operating on different pressure settings. Line air pressure is also available through two additional valves. Two air powered pumps and two spray guns can be supplied with one air filter, eliminating the need for a separate filter for each pump and spray gun. *Gray Co., Inc.*

Circle 83 on postcard for more data

### Flexible Coupling

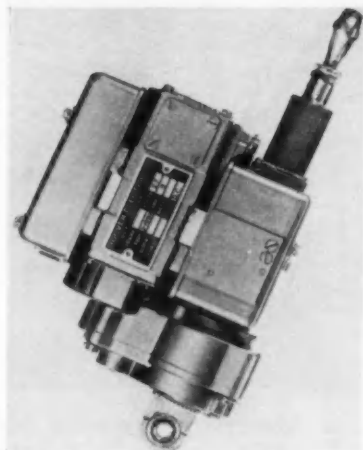
The U. S. Powergrip flexible coupling, a positive dry coupling that never requires lubrication, is made up of three component parts: a heat and oil resistant neoprene sleeve with axially molded internal teeth and two metal end fittings with groove that match the sleeve's teeth.

Powergrip couplings are made in two basic hub sizes with two, four, and six-ply rubber variations to increase torque capacity for each hub size. These six units satisfy standard requirements for loads up to 40 hp at 1750 rpm or torque loads up to 1440 lb-in. *United States Rubber Co.*

Circle 84 on postcard for more data

## Linear Actuator

Hoover Model D-1890 linear actuators are adaptable for a wide range of aircraft, missile and industrial applications. They operate under a normal load of 860 lb. The basic stroke



is 2.50 in. and can be lengthened or shortened to suit requirements.

The units feature a radio noise filter, adjustable travel limit switches, integral thermal overload protection, electro-mechanical clutch brake for low overtravel and irreversibility, positive non-jamming mechanical stops, adjustable self-aligning end fittings and an anti-rotation device is incorporated on the jackscrow and also serves as a dust shield. *Hoover Electric Co.*

Circle 85 on postcard for more data

## Mounting Screw

Two types of threads, "nibs" under the head, and a special point are incorporated on a screw designed for mounting applications. The left-hand threads and "nibs" permit it to be driven into a panel and retain itself, and the standard right-hand machine screw threads form a stud. Components to be mounted are then positioned onto the stud and secured with a nut. Tightening this nut down on the stud also tightens the mounting screw, because of the left-hand threads. The "nibs" prevent stripping when the nut is tightened to the proper torque.

A special point helps to find the nut and bring it into alignment. Also, it eliminates cross-threading and permits blind applications. It is recommended for mounting various types of electrical equipment onto panels, and for other applications where

studs are required. Any standard head size is available and the screw and length of both threads can be varied. *Shakeproof Div., Illinois Tool Works.*

Circle 86 on postcard for more data

## Ball Bearing Screw

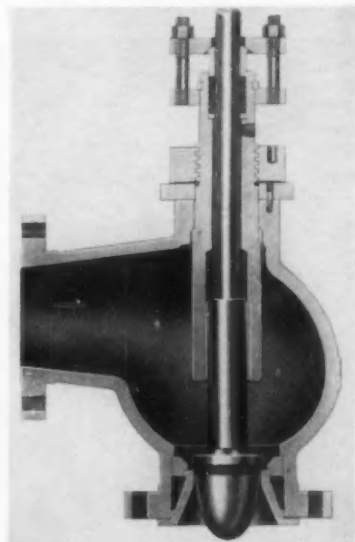
A miniature, light weight ball bearing screw with a 3/16 in. ball circle diameter has been developed by the Saginaw Steering Gear Div. of General Motors Corp. Its applications include electronic controls, missile and rocket guidance telemetering systems, automatic switching devices, electronic machinery controls and many other engineering applications where critical positioning and control problems are encountered.

It is said to operate at near maximum efficiency at temperatures as low as -65 F and to position components to within 0.0005 of an inch for inch of travel.

Circle 87 on postcard for more data

## High Pressure Valves

Control valves available in sizes ranging from 1 to 14 in., with pressure ratings up to 2500 lb ASA, fea-



ture streamlined contours and extra heavy construction throughout. A self-sealing bonnet, oversized stem and stem guide, and Venturi seat ring and parabolic plug are other design features.

Applications include: handling of

erosive and corrosive slurries, coking oils and liquids, experimental wind tunnels, and boiler feed water control. The smaller size valves are equipped with a pneumatically positioned power actuator which provides sensitive valve throttling in response to standard 3 to 15 psi instrument signals. In the larger sizes with high power requirements, they are supplied with the Rotomotor actuator which can handle valve stem loads up to 60,000 lb with precision, stability and sensitivity. *Conoflow Corp.*

Circle 88 on postcard for more data

## Fastening System

The Timesaver Line is a fastening system developed to provide a solution to the problems of misalignment and installation or service damage of



self-locking plate nuts. The line features a replaceable nut element which can be removed and replaced in five seconds with a simple tool. Alignment problems and the necessity for setup screws or other holding devices during location and riveting are eliminated. *Nutt-Shel Co.*

Circle 89 on postcard for more data

## Moving Coil Mechanism

A mechanism featuring a gravity-compensated flexure pivot bearing system has been designed to meet the severe environmental exposures of vibration and acceleration found in flight instrumentation of high performance aircraft.

Pivot members, arranged in pairs, are calculated to serve as calibrated springs, provide restoring torque, and are so disposed as to properly counteract and cancel out the forces introduced by gravity for any orientation of the moving coil system. The gravity-compensated flexure pivot provides a frictionless bearing permitting infinite resolution without axial or radial play. *Marion Electrical Instrument Co.*

Circle 90 on postcard for more data

Continued from Page 43

and drop faster when manufacturers phase out current production.

Production schedules for the balance of the year will be held back. There is a general feeling the industry would like to close up shop early (perhaps three weeks or a month) so that inventories can be pared and 1959 models brought out in a healthy atmosphere.

### **Automotive Supplier Predicts 1958 Production of 4 Million**

Allen Industries, Inc., with about 70 per cent of its production going to the automobile industry, is bracing itself for a decline in business and predicting the automobile industry will produce only 4 million passenger cars this year. The Detroit producer of cotton, jute and vinyl coverings has cut its production schedules accordingly.

Allen Industries' net sales for the first quarter dropped from \$12.9 million to \$9.3 million, and earnings fell from \$447,235 to \$273,022.

### **Engineering Advances Called Vital to Car Industry Growth**

Yearly improvements which automotive engineers design and build into cars are vital to the growth of the industry, according to Chrysler vice-president E. C. Quinn. In a recent speech, Quinn said people buy new cars in many cases because each year the new models have a lot more to offer than the models of the previous year.

Continuous change and development must be continued, he added, to maintain the phenomenal growth of the automobile business.

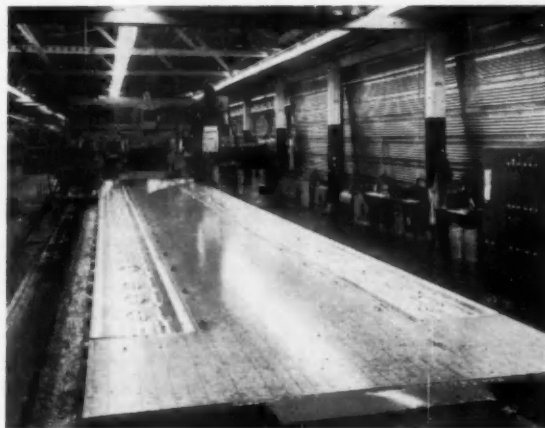
### **Firestone Sales, Earnings Are Down in First Quarter**

Firestone Tire & Rubber Co. reports a drop in both sales and net earnings for the first quarter of the current fiscal year.

Sales for the period dropped from \$268,094,881 a year ago to \$250,274,188, a decline of 6.7 per cent. Net earnings dropped from \$13,710,790 a year ago to \$11,697,239, or nearly 15 per cent.

### **SKIN MILL**

*This 12 by 80 ft Kearney & Trecker skin mill is shown producing simultaneously two sculptured wing skin panels for the Boeing B-52G Stratofortress. All intricate motions of this giant skin mill are controlled by information on a magnetic tape. This is one of several such machines now in use at Boeing's Seattle and Wichita plants.*



### **Aeronutronic Gets Contract For Mobile Army Command Post**

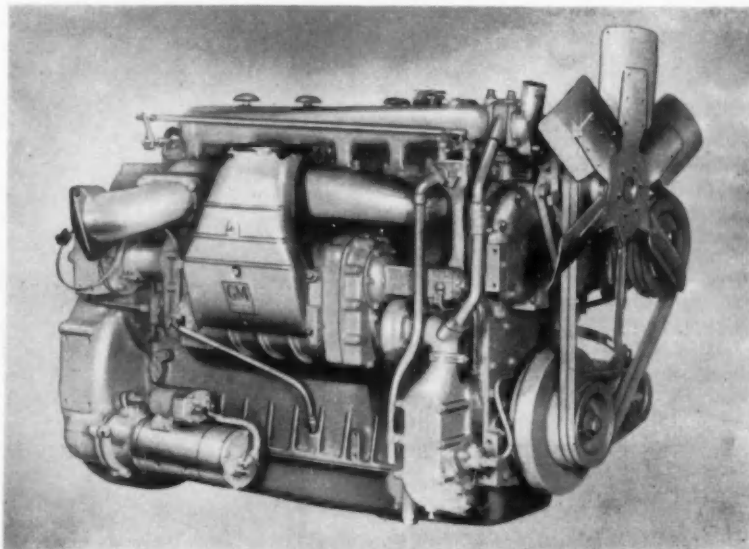
Aeronutronic Systems, Inc., a subsidiary of Ford Motor Co., has been awarded a \$6,851,000 contract by the Army to develop a mobile automated command post.

The Army described the new project as a tactical army operations center, which is designed to give field commanders much faster control over dispersed tactical elements. It will provide, the Army said, "a greatly re-

financed means of selecting target priorities, and coordinating the weapons, electronic warfare, tactical aircraft, and combat surveillance elements of the command."

The center will be mounted in vans and will include a computer complex, and data processing and visual display equipment.

Work on the study phase of the four-year project will begin at once at Aeronautics new research and development center at Newport Beach, Calif.



### **GM DIESEL ENGINE WEIGHS ONLY 1710 LB**

*This new Diesel six-cylinder engine is the latest addition to Detroit Diesel Engine Div.'s new line of 71-E truck engines in the 210-hp range. Its low weight—only 1710 lb—was made possible by liberal use of aluminum alloys in the cylinder block, balance weight cover, and other components. The engine develops peak horsepower at 2100 rpm, with maximum torque of 577 lb/ft at 1200 rpm.*

# What to do when the **BUBBLE-BREAKS**



Trucks, buses, trailers, tractors, off highway equipment, and private motor cars of almost every prominent make use Burton Leaf or Coil springs as original equipment.



When you want reliability  
...dependability...specify  
Steel Springs. Come to  
Burton to get them!



It all looks very pretty . . . then POW . . . those plans that looked so good on paper turn out worse than worthless when they're on the road. That's why correct engineering is so important in the automotive industry.

For many years, Burton Spring engineers have made a specialty of translating engineering ideas into the sound reality of tempered steel. Steel Springs not only offer a time-tested way to absorb road shocks, but they possess inherent structural qualities that make for stability and endurance in the entire vehicle. They not only soften and control vertical motion, but efficiently control lateral and longitudinal "play," side sway and rocking.

## **BURTON**

**AUTO SPRING CORP.**

. . . Vital Support for the Automotive Industry . . .

WESTERN AVENUE AT FORTY-EIGHTH STREET

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# A I R B R I E F S



By RALPH H. McCLARREN

## Small Business Subcontractors Benefit By Missile Work

Of the \$1 billion paid to subcontractors of the aircraft industry engaged in ballistic missiles work during 1957, more than \$267 million was, in turn, paid out to small business subcontractors, according to the Aircraft Industries Association.

The fact that small business firms are playing a major role in the ballistic missile program becomes more significant considering that their share of the business during the last year was based primarily upon research and development activities of the industry. Their share of the business should be somewhat larger now as the industry moves into the production phase of the program.

## U. S. Prop-Jet Electra On Exhibition at World's Fair

Lockheed Aircraft Corp. has prepared an exhibit of the Prop-Jet Electra for the Universal and International World's Fair to be held in Brussels, Belgium, from April 17 to October 19, 1958. Located in the "Hall of Aeronautics" within the Transportation Pavilion, it will illustrate the Electra's advantages to air travelers for short and medium distance flights.

## Numerical Control Machining Cuts Costs

Numerical control is paying big dividends through reducing the cost and time involved in conventional machining methods, ac-

cording to reports received by the Aircraft Industries Association.

One cost analysis on milling aircraft wing skins showed that the cost by using the numerical control method was \$20,610 compared with \$45,040, by the conventional method. The saving in time was equally impressive: 3,249 man hours for numerical control; 6848 man hours by conventional means.

In another comparison test, which consisted of cutting spiral grooves in a casting, the conventional machining method cost \$856 and consumed 132 man hours. The same job, accomplished by numerical control, cost only \$314, and required 25 man hours.

A breakdown of time involved for another part reveals these facts:

Numerical Control Method		
Preparation .....	5.9	man hours
Machine time .....	1.75	man hours
Total .....	7.65	man hours
Conventional Method		
Preparation .....	165	man hours
Machine time .....	4.66	man hours
Total .....	169.66	man hours

## Aircraft Employment Decline Continues

For the ninth consecutive month since April 1957, employment in the aircraft and parts industry continued to decline, dropping to 774,200 workers in January, 1958, according to the most recent report of the Bureau of Labor Statistics.

The total employment drop from a high of 909,100 workers in April to January is 134,900 workers, a decrease of nearly 15 per

cent. Employment was expected to continue to drop for February. Although the Defense Department in recent months has placed substantial orders with the industry, the long lead times for major components (up to 30 months) does not permit an immediate gain in employment following receipt of orders.

## Fairchild's F-27 Prop-Jet Airliner Completes Maiden Flight

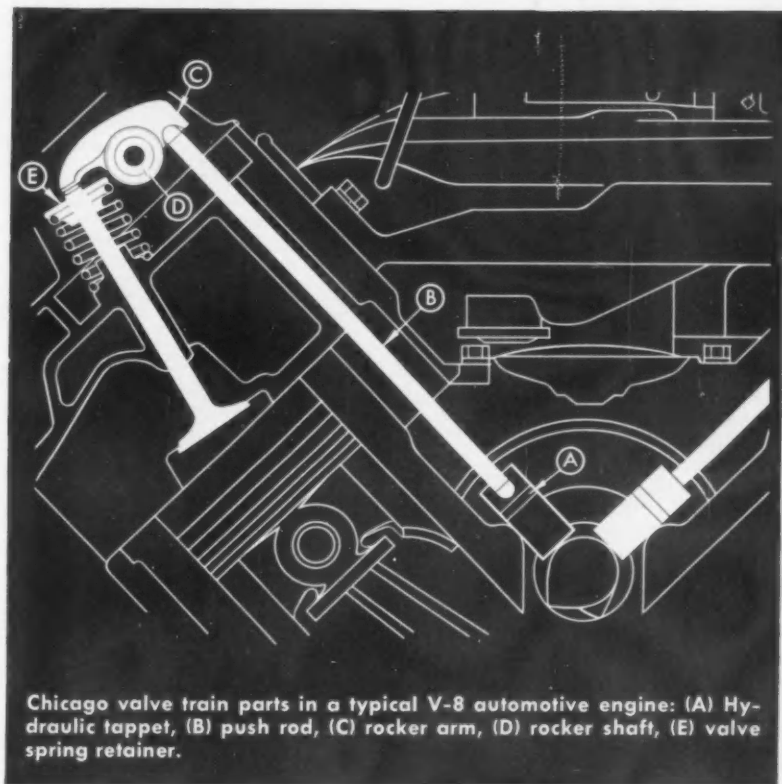
The Fairchild F-27 successfully completed its first flight on April 15, 1958. Richard S. Bouteille, president of Fairchild Engine and Airplane Corp. has announced that the first flight of the Fairchild F-27 ushers in a new era of luxurious limousine air travel for millions of passengers using the nation's busy and rapidly expanding local service airlines.

"Up to now," he said, "these airlines have had to rely on slow, hand-me-down equipment. The F-27 is the first airliner ever designed specifically to meet the special requirements of local airlines for fast, economical and comfortable air travel."

## Flying Nuclear Reactor To Be Ground Tested

The "flying" nuclear reactor designed and built for the U. S. Air Force at Convair (Fort Worth) Division of General Dynamics Corporation has been transferred to Oak Ridge, Tenn., where it will be suspended from four 300-ft towers for further  
(Turn to page 160, please)

**For all engines - - -**



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

*Passenger cars*



*Trucks*



*Tractors*



*Diesels*



*Aircraft*



**Everything you need in valve gear**

**from CHICAGO**

Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

**Design and Engineering**—at Chicago you'll find valve gear engineering experience in depth . . . men who understand your problems and will work with your engineering staff in designing cam shafts and complete valve gear assemblies for any type of engine.

**Manufacturing**—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

**Testing**—we have complete laboratory and engine testing facilities.

For the full story of how we can serve you, write our Tappet Division.

**THE CHICAGO SCREW COMPANY**

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

# The BUSINESS PULSE

*No Definite Uptrend in Business Has Yet Developed, But Rate of Decline Has Moderated in Some Areas. Inventory Liquidation Still Has Some Distance to Go, to Judge from Inventory-to-Sales Ratios.*

Additional indications have emerged during the past month which suggest that the business decline may be slowing. Output curtailment has moderated in some manufacturing areas, and the flow of new orders has been slightly larger in certain industries. The change has been of modest proportions, to be sure, but it is certainly welcome in the light of the almost consistently bleak pattern which prevailed during the autumn and winter months.

It is too early to evaluate adequately the significance of what is happening. The evidence is as yet fragmentary, with some individual situations very difficult to appraise because of seasonal influences, and it will probably take another two to three months to determine whether the flattening out is significant or merely temporary.

Of course, even if the decline has slowed, this does not necessarily mean the economic climate will get spectacularly better in the near future. In the 1954 recession and also in other past instances, the pace of decline moderated well in advance of the final trough, and there might well be a repetition of such a pattern this time.

## **No Definite Improvements in Indicators**

Normally, there are foreshadowing hints of the final trough well ahead of its actual occurrence, and so far these have not emerged in clearly recognizable form. No clear-cut improvement has yet been registered in the so-

This Survey, published for the readers of automotive magazines exclusively in **AUTOMOTIVE INDUSTRIES**, has been prepared by the Guaranty Trust Company of New York

called leading indicators, nor has an uptrend developed in indices of the diffusion variety, such as appeared well in advance of the troughs of 1949 and 1954. These foreshadowing series do give somewhat more favorable readings now than in the winter period when the general downtrend was pronounced, which means that they could be on the verge of an upturn; but if past performance is a reliable guide, this would still indicate a final trough no earlier than the midsummer period. This suggests, in turn, that positive revival in the economy should not be looked for until after Labor Day, at the earliest. It would be unwise to place exclusive reliance on mechanical guides, but in this instance the suggestion of delayed revival takes on credibility from other known trends in the economy. From all present indications the decline in capital spending will continue through the remainder of the year. Inventory liquidation also seems to have some distance to go, to judge from inventory-to-sales ratios and from the fact that retrenchment to date has been considerably smaller than full liquidation in either the 1949 or the 1954 recession. And consumer spending still seems to be characterized by lethargy,

with no hint so far of any significant improvement in the case of major durable items in the months immediately ahead.

## **Rising Government Outlays**

Currently rising outlays by Governmental bodies — Federal, State, and local—constitute offsets, but only partially so. From the final quarter of 1957 to the first quarter of this year, new-order placement by the Federal Government was accelerated, but there was no upturn in actual spending. Such an uptrend appears to be in progress now, but it seems doubtful that the change is sharp enough as yet to tip the scales quickly in the direction of revival, although it is probably exerting an important moderating influence on the decline.

## **New Housing Activity**

A good deal of emphasis these days is being placed on residential construction as a possible factor of strength, now that mortgage terms have been liberalized and the VA program extended. Yet it should be appreciated that an increase in the number of housing units financed with Government-aided mortgages would not necessarily mean a rise in total housing activity. In 1956 and 1957, when for various reasons Government-aided mortgages could not be obtained as easily as before, conventional-mortgage financing was turned to as an alternative. The number of housing starts financed conventionally

*(Turn to page 171, please)*

# what do you want

## from your bearing supplier?



It is interesting to note the reasons given by leading vehicle manufacturers for their use of BCA ball bearings as original equipment.

Product quality, of course, ranks first in importance.

Prompt, as-promised delivery scored very highly.

BCA engineering assistance was rated by many as being of prime importance.

BCA has had over half a century of specialized experience in the design and manufacture of ball bearings for car, truck, bus, tractor and farm implement manufacturers. Many of our customers have credited BCA with having made valuable contributions toward reduction of production costs and improvement of operating efficiency of their vehicles. We may be able to help you.

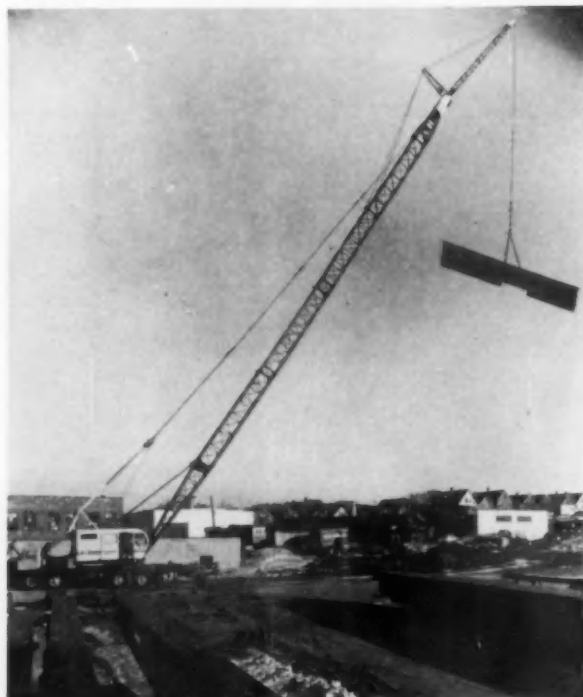


**BEARINGS COMPANY OF AMERICA**

DIVISION OF  
Federal-Mogul-Sover Bearings, Inc.



# • • • • Trends in the CONSTRUCTION EQUIPMENT INDUSTRY



By  
**Kenneth  
Rose**

**Harnischfeger  
70-ton truck  
crane**

**W**HEN the new highway bill became law April 16, with its promise of a speedup in road construction over the next three years, it brought the hope of easing a situation among construction equipment manufacturers that had brought their production down to about 59 per cent of capacity and employment to about 66 per cent of normal. Opinions differed among industry leaders as to the immediate effect of the bill upon equipment manufacturers.

Harmon S. Eberhard, president of Caterpillar Tractor Co., said, "Good news for Caterpillar people. It should help return construction of the Interstate System to its original 13-year schedule. In addition, it provides an immediate stimulus for work on primary, secondary, and urban systems — the ABC roads.

"The bill's principal impact will

be on 1959 highway construction. It will also have some effect in late 1958 in those states, such as Illinois, which are already well along in their programs. For this latter reason, and because of the favorable psychological effect on customers now planning equipment purchases for future work, we are hopeful that our sales for this year will benefit. It is still too early, however, to determine the near future effect of the new legislation on either sales or employment."

Julien Steelman, president of Koehring Co., and president of American Road Builders Association, saw the bill's results this way; "It probably will not have much immediate effect, as much of the equipment in the hands of contractors is not now employed. As the season progresses, contractors may increase their buying in anticipation of future work, and

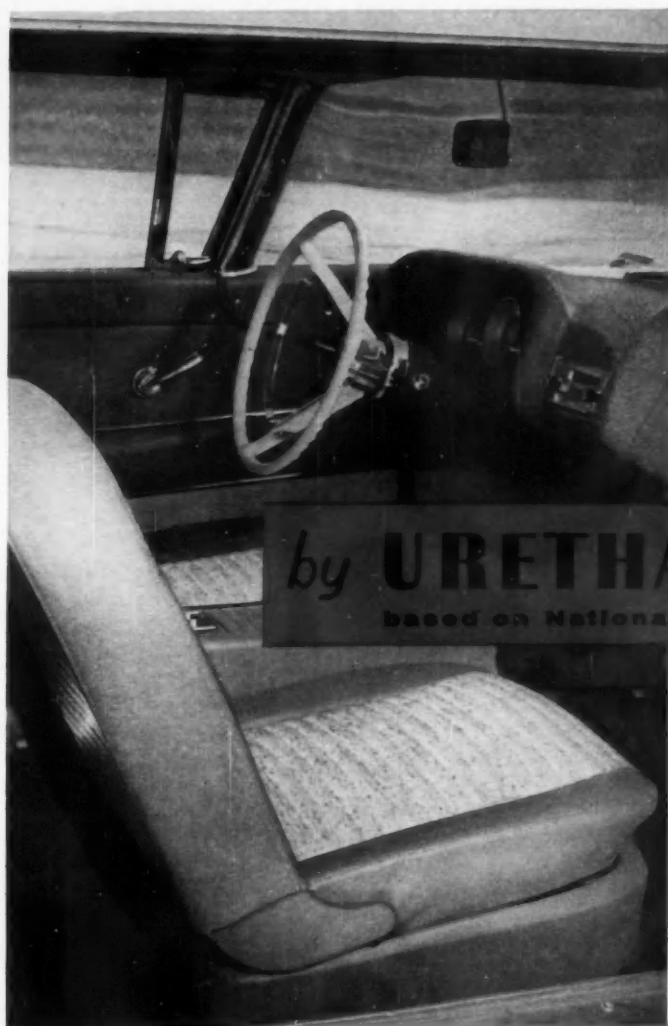
this may have an effect on sales in the third and fourth quarters of 1958. Normally the peak demand is in the second quarter, tapering off during the third and fourth quarters, but the bill may alter this. Buying in the industry for the past eight to ten months has been lower than the normal replacement level."

Clarence E. Killibrew, vice-president of Clark Equipment Co. and general manager of its construction machinery division, pointed out that his company's situation was not typical, as they were relative newcomers to the construction equipment field and had no inventory problems. "The immediate effect of the new bill will be to provide a \$1.150 billion increase in contract volume. Machines for this added volume will probably not be needed until early 1959, but there should be no problem in getting this equipment to the user. Most equipment manufacturers are working well below capacity, averaging about 60 per cent of capacity now."

Harald T. Reishus, vice-president of International Harvester Co. and head of its construction equipment division, said of the bill, "It can't do anything but help. It will be a few months before we feel the effects of it—for contracts to be let. There will probably not be much effect in 1958, but I am hopeful for 1959, and enthusiastic about 1960."

## **Federal Aid Highway Act**

Some of the features of the Federal Aid Highway Act of 1958, (Turn to page 154, please)



## *America Rides Cushioned and Cooled*

*by* **URETHANE FOAM!**

based on National Aniline's NACCONATE®

More and more, urethane foams are used in cars for crash-padding, comfort cushioning, insulation and vibration dampening! Labor-saving fabrication and low cost make them doubly attractive in a dozen different applications.

They are extremely versatile cushioning materials. Resilience can be controlled to provide comfortable seating or impact-absorbing safety pads.

Either topper-pads or full thickness seat cushions can be bonded to outer coverings for snug, permanent fit. Arm rests, luxuriously padded interior panels and rug underlays can be made by one-operation foaming-to-fabric.

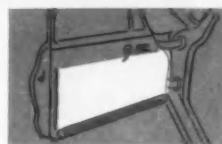
Thin headliners afford remarkable protection against summer sun and winter's cold. In air-conditioned cars urethane foams can provide insulation throughout... and soundproofing against road noises, too! When rigid foams are used they add lightweight structural support.

As makers of NACCONATE® diisocyanates, chemical components in urethanes, National Aniline is ready now with competent technical assistance for automotive engineers, designers and suppliers who wish to capitalize on this material. Your letter will bring prompt response.

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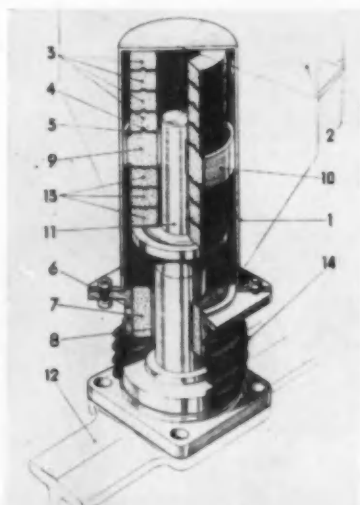


Fig. 1—Details of Viberti-Poglioli suspension

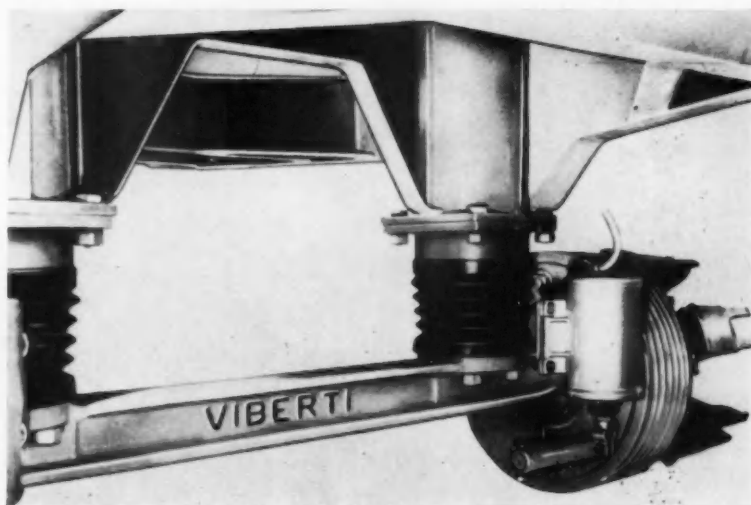


Fig. 2—External view of Viberti-Poglioli suspension.

## New Italian Suspension System for Motor Vehicles

**T**HE new Viberti-Poglioli suspension for motor vehicles with which the Viberti Co. in Italy has been experimenting recently has been tested on long runs and in all weathers, according to the company.

It consists, as shown in Fig. 1, of a cylinder (1) welded to the chassis frame (2). Inside this cylinder there are plastic rings

(3) equipped with centering ribs (4). Each ring is separated from the next by a steel ring (5). A heavy extension (6) is affixed to the lower extremity of the cylinder.

A plastic ring (7) and an inner bronze ring (8) are incorporated in it.

Inside the cylinder there is another plastic ring (9) fitted ex-

ternally with a bronze ring (10), both of which slide freely inside the cylinder. This ring (9) is attached to the rod (11) the lower extremity of which is welded to the axle (12). Between the ring (9) and the ring (7) there are other rings (13) which are of the same type as the upper rings (3). Rubber bellows (14) insure airtightness between the part fastened to the chassis and the part welded to the axle.

In this manner, the parts (7) and (9) act as centering pieces for the two parts of the suspension, absorbing lateral stresses. The rings (3) and (13) act as elastic pads.

The suspension requires no adjusting or lubrication.

### Willys May Be First in Brazil To Manufacture Passenger Cars

Willys Motors, Inc., still toying with the idea of building the Aero Willys in Brazil, could be the first manufacturer of passenger cars in that country.

Willys already has received government permission to build the car at the plant of its Brazilian subsidiary. A company spokesman said recently that Willys has extreme confidence in the economic development of the South American nation and is "studying measures" to expand its operations in Brazil.

Willys already is making Jeep vehicles in Brazil. Other manufactur-

ers have announced plans to build commercial vehicles in Brazil, but Willys could be the first company into passenger car production since its Aero dies are waiting to be used.

### Foreign Cars for Display To Be Admitted Duty-Free

Foreign cars and automotive parts will be admitted duty-free to the U. S., for display purposes, under a bill that soon becomes law.

Passed by the Senate, with two changes, is the House-approved bill, H. R. 776. One change would permit temporary free entry only if foreign nations concerned grant the same

privileges for American cars. The other would require bonding of the imported products, which would have to be exported within six months of the entry date.

Rep. Machrowicz, D., Mich., author of the bill, tells AUTOMOTIVE INDUSTRIES he has no objection to the Senate changes. Auto producers are interested in the limited-time free entry of cars from countries which already have reciprocal privileges in effect. And admission of the foreign products under bond is seen as a workable plan.

Once the House has agreed to the amended bill, as is anticipated, the measure will be cleared for the President.

**BRIDGEPORT BRASS COMPANY**

**Welds Aluminum Tubing at speeds up to**

**120 fpm**

**with an**

**Allis-Chalmers Induction Heater**



**M**R. HIGHER FREQUENCY and the Allis-Chalmers induction heater solved an important production problem and gave Bridgeport Brass tremendous welding speed. Because aluminum has an abrupt melting point and a tendency to buckle, conventional arc welding yielded but a few feet per minute. By confining heat to a thin surface layer at the contacting edges of the formed tubing, Allis-Chalmers induction heating produced amazingly good results where previous methods failed.

#### **Why Allis-Chalmers**

Allis-Chalmers enhances induction heating's inherent speed with properly designed work handling equipment. An automatic timer and output controls, standard on Allis-Chalmers units, promote precision operation. Extensive laboratory facilities, unparalleled application experience, factory supervised installation and service assure complete dependability.

If you braze, solder, harden, anneal or heat for forging or melting, it will pay you to get all the facts on Allis-Chalmers induction heaters. See your nearby Allis-Chalmers representative or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wis.



Heart of Bridgeport's integrated mill is a 50-kw Allis-Chalmers induction heater. Coil is interchangeable to accommodate various tube sizes.



A-5456

**ALLIS-CHALMERS**

# • • INDUSTRY STATISTICS • •

## WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending		Year to Date	
	May 3	April 26	1958	1957
<b>PASSENGER CAR PRODUCTION</b>				
Rambler	4,177	3,439	57,653	36,304*
Total—American Motors	4,177	3,439	57,653	36,304*
Chrysler	1,353	1,267	20,666	51,270
De Soto	613	1,151	13,652	57,182
Dodge	3,210	601	36,512	116,322
Imperial	277	335	9,035	16,846
Plymouth	8,024	7,223	138,465	256,419
Total—Chrysler Corp.	13,377	10,577	215,352	498,045
Edsel Ford	604	10	5,525	
Ford	19,849	17,883	366,106	579,287
Lincoln	457	448	11,788	18,438
Mercury	42	3,783	42,755	131,707
Total—Ford Motor Company	20,952	22,104	426,177	729,433
Buick	3,131	4,992	100,115	184,378
Cadillac	3,209	2,570	53,856	59,496
Chevrolet	27,130	2,474	496,426	554,818
Oldsmobile	3,810	7,312	130,443	171,260
Pontiac	2,503	4,227	90,886	149,338
Total—General Motors Corp.	39,883	21,575	873,730	1,119,289
Packard		68	1,273	4,469
Studebaker	60	675	11,462	21,280
Total—Studebaker-Packard Corp.	60	941	12,735	25,749
Checker Cab	96	95	1,431	1,624
Total—Passenger Cars	78,545	58,731	1,587,098	2,410,444
* Includes Hudson and Nash.				
<b>TRUCK AND BUS PRODUCTION</b>				
Chevrolet	6,264	4,142	103,100	130,312
G. M. C.	1,131	1,391	22,409	26,026
Diamond T	100	95	1,906	1,563
Dirco	60	60	1,044	1,333
Dodge and Fargo	1,191	1,317	19,064	30,864
Ford	4,868	4,659	78,845	127,217
F. W. D.	28	26	463	291
International	1,767	1,819	36,620	35,356
Mark	292	295	5,265	6,226
Studebaker	226	306	4,088	4,166
White	323	319	6,424	7,034
Willys	1,757	1,880	26,229	26,062
Other Trucks	60	60	1,090	1,556
Total—Trucks	17,764	16,368	309,567	396,126
Buses	85	55	1,331	1,521
Total—Motor Vehicles	96,394	75,154	1,897,996	2,810,091

## 1958 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	Two Months		
	February	1958	1957
<b>Vans</b>			
Insulated and refrigerated	222	438	657
Steel	12	44	120
Aluminum	210	391	577
Semi-insulated	39	107	156
Steel	39	107	25
Aluminum	99	202	131
Furniture	99	202	335
Steel	99	202	322
Aluminum	1,176	2,549	3,825
All other closed-top	374	996	1,779
Steel	802	1,583	1,649
Aluminum	154	336	648
Open-top	57	158	349
Steel	97	190	297
Aluminum			
Total—Vans	1,690	3,629	5,462
<b>Tanks</b>			
Non-and low pressure			
Petroleum	178	336	
Carbon and alloy steel	19	42	
Stainless steel	93	196	
Aluminum			
Total—Petroleum	288	574	864
Chemical, food, fluid solids	62	110	
All other, incl. aircraft refuelers	10	20	
High pressure (LPG, chemicals, etc.)	24	53	
Total—Tanks	384	757	1,071
<b>Pole, pipe and logging</b>			
Single axle	30	51	63
Tandem axle	42	66	92
Total	72	117	155
<b>Platforms</b>			
Racks, livestock and stake	130	253	102
Grain bodies, all types	56	101	293
Platforms (flats), all types	330	722	1,301
Total—Platforms	516	1,076	1,696
<b>Low-bed heavy haulers</b>			
Dump trailers	158	301	446
All other trailers	96	185	324
Total—Complete Trailers	3,009	6,344	9,663
Trailer chassis <sup>1</sup>	252	538	508
Total—Trailers and Chassis	3,261	6,882	10,171
<sup>1</sup> Sold separately.			

## REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	March			Three Months		Per Cent Change		
		1958	February 1958	March 1957	1958	1957	Mar. over February	Mar. over Mar. 1957	Three Months 1958 over 1957
1	New England	20,824	15,043	28,992	52,995	67,041	+36.44	-22.82	-20.95
2	Middle Atlantic	78,666	54,302	123,723	204,391	257,683	+44.90	-36.40	-20.66
3	South Atlantic	53,255	41,800	67,594	148,659	191,536	+27.48	-21.17	-22.39
4	East North Central	92,759	78,147	141,045	259,331	369,744	+18.70	-34.23	-29.86
5	East South Central	20,918	16,432	26,490	53,421	70,680	+27.30	-21.03	-24.40
6	West North Central	37,380	32,626	51,677	104,138	126,471	+14.57	-27.67	-17.66
7	West South Central	36,420	37,793	47,516	114,730	139,493	- 3.63	-23.35	-17.75
8	Mountain	14,520	13,957	16,783	42,229	46,141	+ 6.32	-13.46	- 8.48
9	Pacific	46,009	43,760	71,497	136,120	160,213	+ 5.09	-35.65	-24.47
Total—United States		400,501	333,580	572,917	1,115,013	1,448,962	+20.06	-30.09	-22.98

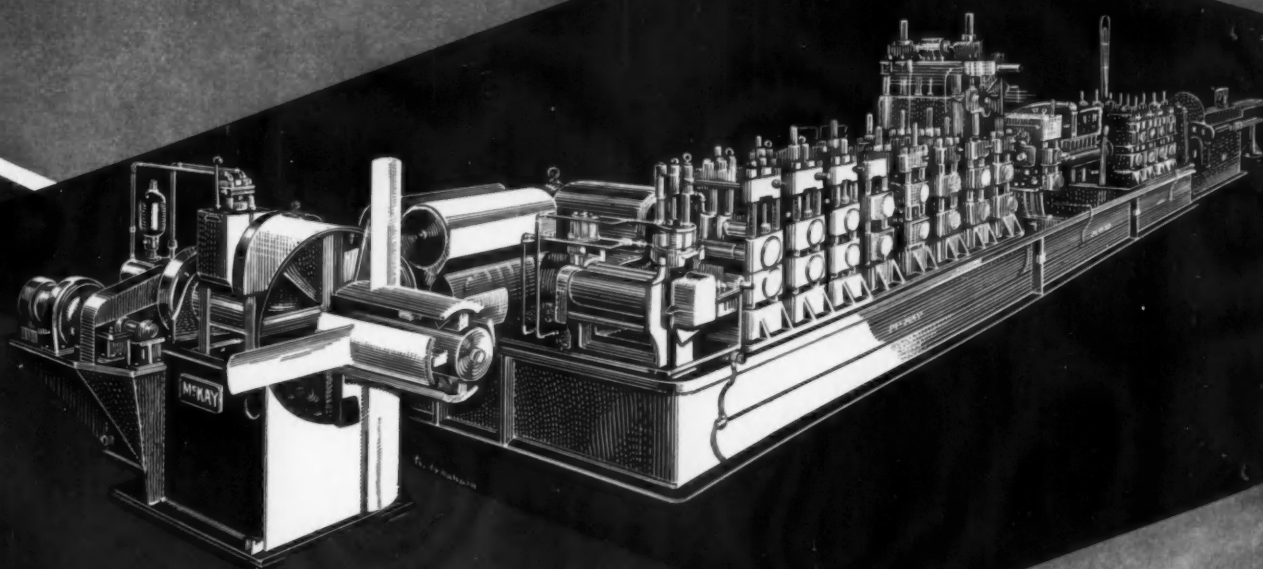
States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan.,

Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida. Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.

## 1958 TRUCK FACTORY SALES BY G.V.W.

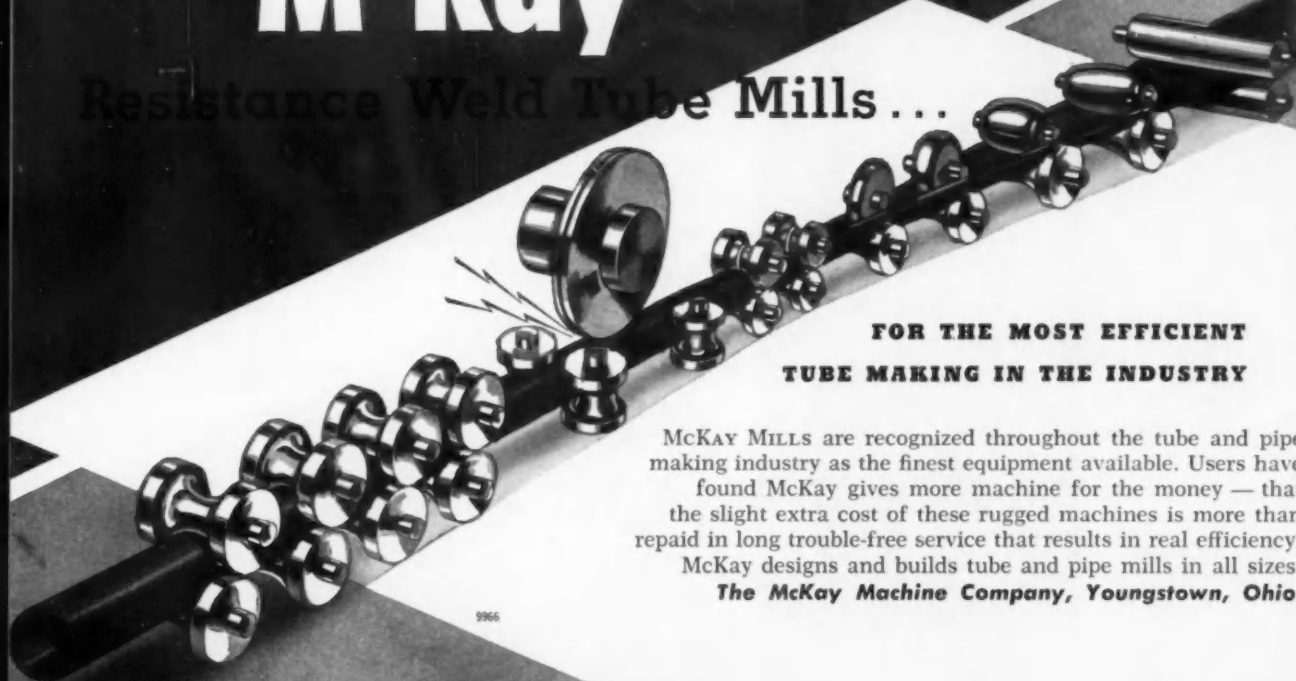
As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	Over 33,000 lb.	Total
January	39,162	12,106	1,261	7,911	9,953	4,378	2,742	2,224	79,777
February	35,777	10,025	1,152	7,791	7,336	4,329	2,691	1,955	71,056
March	36,378	10,528	1,101	7,211	7,717	4,968	3,231	2,541	73,666
Total—Three Months	111,317	32,659	3,514	22,913	25,006	13,666	8,664	6,720	224,499
Total—Three Months	139,578	38,996	9,157	39,434	16,509	11,533	10,298	9,085	274,567



# McKay

## Resistance Weld Tube Mills...



**FOR THE MOST EFFICIENT  
TUBE MAKING IN THE INDUSTRY**

McKAY MILLS are recognized throughout the tube and pipe making industry as the finest equipment available. Users have found McKay gives more machine for the money — that the slight extra cost of these rugged machines is more than repaid in long trouble-free service that results in real efficiency. McKay designs and builds tube and pipe mills in all sizes. **The McKay Machine Company, Youngstown, Ohio.**

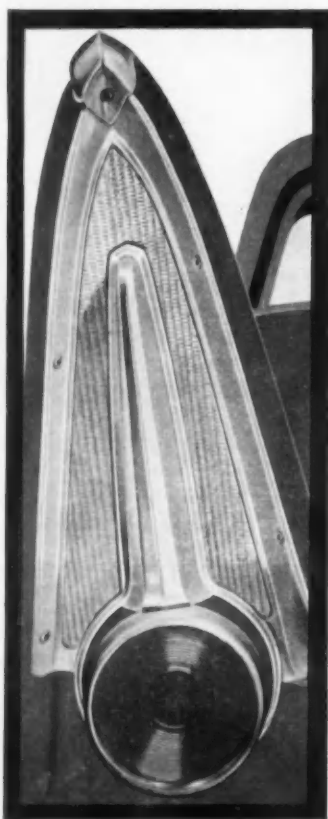
9966



SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS




From Tassell  
Hardware: the  
appeal of TEXTURE



Textured trim of Alcoa® Aluminum, we submit, triggers an interesting chain reaction in the automobile showroom. First, the prospect is lured in for a closer look; then a touch; finally, sales resistance starts to melt away in the warm glow of contemplation . . .

The Tassell Hardware Company, Grand Rapids, Michigan, skillfully abets this subtle inveiglement of the senses. In the stamped, embossed taillight assembly shown, light is trapped by a thousand tiny facets to multiply the illusion of beauty. Tassell works similar texturing miracles on grille and radiator ornaments, always with the same expert craftsmanship that turns out some of the nation's finest cabinet hardware, automotive and precision aircraft parts.

Though Alcoa does not make automotive trim, our collaboration with creative fabricators such as Tassell has contributed significantly to the industry. Most of the modern techniques for forming, coloring and texturing aluminum have sprung from these fruitful associations. Every new styling cycle produces richer evidence of the results.

**ALCOA**  **ALUMINUM** gives every car more **GLEAM AND GO**

**ALUMINUM IS TEXTURE** Reward the touch with a surface like satin . . . or safeguard stair treads with a bite as harsh as a grindstone. Aluminum's infinite range of textures spans both extremes . . . knows no limitations between them . . . holds an answer for the greatest stretch of the designer's imagination. Alcoa invites you to share its intimate knowledge of this most versatile metal. Your first step: turn the page.



**ALCOA IS ALUMINUM**



## Aluminum is TEXTURE

Texture finds unlimited expression in aluminum through a wide variety of mechanical, metallurgical and organic finishes.

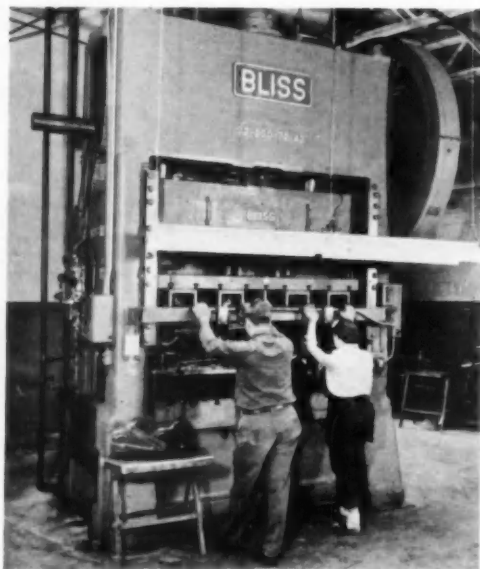
**Mechanical Finishes.** *Polishing and buffing* give aluminum a mirror-like brilliance, bringing its natural luster to the highest peak. *Sandblasting*, in contrast, subdues its glow, produces a mellow matte effect. *Scratch-brushing* imbues the surface with a coarse-lined texture; a satin sheen emerges when a finer brush is used. *Barrel burnishing* produces a fairly smooth surface, useful on many low-cost items, and lends itself to high-speed, high-volume operations. *Hammering* gives aluminum the rich variegation of hand-wrought silver. *Embossing, coining and engraving* afford limitless pattern and design possibilities in sharp, clear, minute detail. *Perforating* is often used on screens and panels for unusual and interesting decorative effects. *Pattern rolling* offers a literally infinite variety of textured designs, including the coarse-grained "Butler-type" finish, developed by Alcoa to reproduce the effect of belt sanding, at a fraction of the cost.

**Chemical Finishes.** *Anodizing* converts aluminum's natural oxide film to a sapphire-hard coating having excellent wear and corrosion resistance, with infinite color, tone and texture possibilities. *Plating* can be per-

formed with a full range of metals, using proper surface preparation techniques. *Chemical- and electro-brightening*, particularly useful with irregular shapes and curved surfaces, create the brightness of some buffed surfaces at lower cost than mechanical polishing. *Etching* with acids or alkalis offers a diversity of three-dimensional effects, from sparkling frosted finishes to smooth reflector surfaces. *Deep etching* creates intricate design patterns of unusual eye appeal. Use of *photosensitive resists* assures accurate and fine detail. With *masks, resists and stop-off methods*, numerous combinations of the above techniques are possible.

**Metallurgical Finishes.** *Spangling* aluminum with Alcoa's new controlled-growth grain process produces a glittering, multifaceted surface that reflects light from a thousand tiny mirrors; anodic colors can be added as desired. Certain *alloys* give important color and tone advantages; high purity alloys give clear, transparent, anodized finish; silicon alloys impart a gray tone, chromium a pleasing yellow tint, and manganese a brownish coloration.

**Organic Finishes.** *Painting, lacquering and enameling* aluminum, in clear finishes and opaque coatings, have both protective and decorative value. Paints and pigments have a high adherence to aluminum, making it an excellent base for all color coatings of the conventional type. Any durable paint, lacquer or enamel can be applied if the surface is properly prepared. Coatings can be dipped, brushed, sprayed or rolled on.



**Stamped Embossing at Tassell Hardware—** A leading fabricator of aluminum, Tassell Hardware Company works closely with Alcoa to provide you with a complete and knowledgeable source of aluminum design and fabricating information. Write: Tassell Hardware Company, 4135 Lake Michigan Drive, Grand Rapids 4, Michigan.

### Get more information on designing in aluminum

Write for Alcoa's inspirational bibliography which describes Alcoa books and films to help you design in aluminum. Aluminum Company of America, 2187 Alcoa Building, Pittsburgh 19, Pa.



Your Guide to the Best in Aluminum Value



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Exciting Advertising  
Alternate Media Effortings

(Advertisement)

# Chemical Preparation Systems for Metal Surfaces

What they do, the types available, how they are applied



By J. H. GEYER  
Manager, Product  
Development Dept.  
AMERICAN CHEMICAL  
PAINT COMPANY

Chemical preparation systems are designed to do four jobs and do them well. First, they remove organic soils, shop dirt, scale and rust or corrosion products from the metal surface. Second, they provide surfaces that are completely compatible with subsequent paint or oil films. Third, they produce a *tooth* that promotes good paint or oil film adhesion. Fourth, they effectively prevent underpaint corrosion growth after breakthrough in the paint film.

Basically, there are six types of chemical preparation systems now being used in the automotive industry. These are zinc-iron phosphate, manganese-iron phosphate, iron phosphate, zinc phosphate, and amorphous phosphate and chromate. Each is briefly discussed here.

## Zinc-Iron Phosphate

The ACP Permadine® chemical preparation system forms a heavy, oil-absorptive, crystalline coating on iron and steel products. This becomes highly corrosion resistant when impregnated with a nondrying, rust-inhibiting oil such as ACP Granoleum® No. 20 or a petrolatum-based rust preventive such as ACP Granoleum No. 10. It also provides an excellent base for stains and for paint. Among the many products regularly treated with this type of coating are plug gages, screws, nuts, bolts and rollers. Applied by immersion process, the system usually includes preclean, rinse, coating bath, rinse, and acidulated rinse.



## Manganese-Iron Phosphate

This type of coating is widely used to improve the wear-resistant and anti-galling characteristics of machined reciprocating ferrous elements. Like the zinc-iron phosphates, the coating produced by ACP Thermoil-Granodine® is highly oil absorptive. It is most frequently recommended for the treatment of gears, piston rings, camshafts, cylinders and other rubbing parts. It is applied by immersion process, usually

in five stages. These include preclean, rinse, coating bath, rinse, and final rinse. After treatment parts are impregnated with oil.

## Iron Phosphate

Iron phosphating processes are extensively used in the chemical prepaint treatment of appliances such as refrigerators, water heater shells, ranges, washers, dryers and other *white lines*. These processes will produce excellent paint-bonding films on the metal and retard or prevent underpaint corrosion. Duridine®, ACP's iron phosphating process, is a combination organic soil cleaner and iron phosphate coating material. Both the cleaning and coating operations take place in the same bath. Duridine and other iron phosphates do not lend themselves to brush-on application, are primarily designed for spray type equipment of four or five stages. But several dip installations are successfully operating today by inclusion of an alkali pre-cleaning stage.



## Zinc Phosphate

ACP Granodine® is an example of this type of chemical prepaint treatment process, the type now predominantly being used to treat steel in the automotive industry, and most frequently specified for steel ordnance and military items. This process forms a coating which offers the ultimate in paint adhesion promotion and vastly augments the corrosion resistance of subsequent paint films. Zinc phosphate materials are extremely flexible as to method of application—can be applied by brush, dip or automatic spray equipment. In a typical dip or power spray system, the stages would be alkali clean, water rinse, zinc phosphate treatment, water rinse, and acidulated final rinse. If the metal has considerable areas of rust or scale, an acid pickle should follow the alkali cleaning stage.

On zinc surfaces, the zinc phosphates perform a rather unique function. They act as a barrier against chemical reaction between the applied paint film and the zinc surface. This effectively prevents blistering of the paint and early breakdown of the film. This is in addition, of course, to the improvement of paint adhesion and the retarding of underpaint corrosion. ACP Lithoform® is specially designed for use over zinc surfaces and finds wide application as a prepaint treatment for ornamental zinc die castings,

refrigerator liners, and on most galvanized work requiring painted finishes.

## Amorphous Phosphate and Chromate

These coatings are the films produced by the ACP Alodine® processes on aluminum surfaces. They have met with wide acceptance in the prepaint treatment of venetian blind strips, refrigerator liners, aluminum heat transfer units, aircraft sheet metal assemblies, and many other items fabricated



from aluminum. The various coatings provide an excellent film for the promotion of paint adhesion and effectively prevent underfilm corrosion. As in the case of zinc, aluminum exhibits a tendency to chemically react with some paint systems. The Alodine processes develop a barrier film between the paint and the aluminum surfaces which prevents this objectionable reaction. The Alodines are extremely versatile materials that can be applied to aluminum surfaces by brush, hand spray, dipping, mechanical spraying. Brush application is particularly well adapted to the processing of parts too large for simple dip systems or in manufacturing operations that do not warrant a tank setup. In dip or spray application, the system usually consists of an alkaline preclean, a water rinse, the Alodine treatment, a water rinse, and an acidulated final rinse. Where the surface is heavily oxidized, a de-oxidizer in the line is needed.

## Chemical Blanket for Hot Phosphating Baths

Serseal®, a recent ACP development, produces a chemical blanket on hot phosphating baths to reduce fixed operating costs. The process consists of two chemicals, one for inclusion in the bath, the other for forming a layer on the bath surface. It is particularly effective when added to zinc-iron and manganese-iron phosphate baths.

The major chemical preparation treatments for metals have been covered briefly in this article. More complete information can be had by contacting an ACP sales representative or by writing us at Ambler, Pa.



AMERICAN CHEMICAL  
PAINT COMPANY  
Ambler 24, Pa.

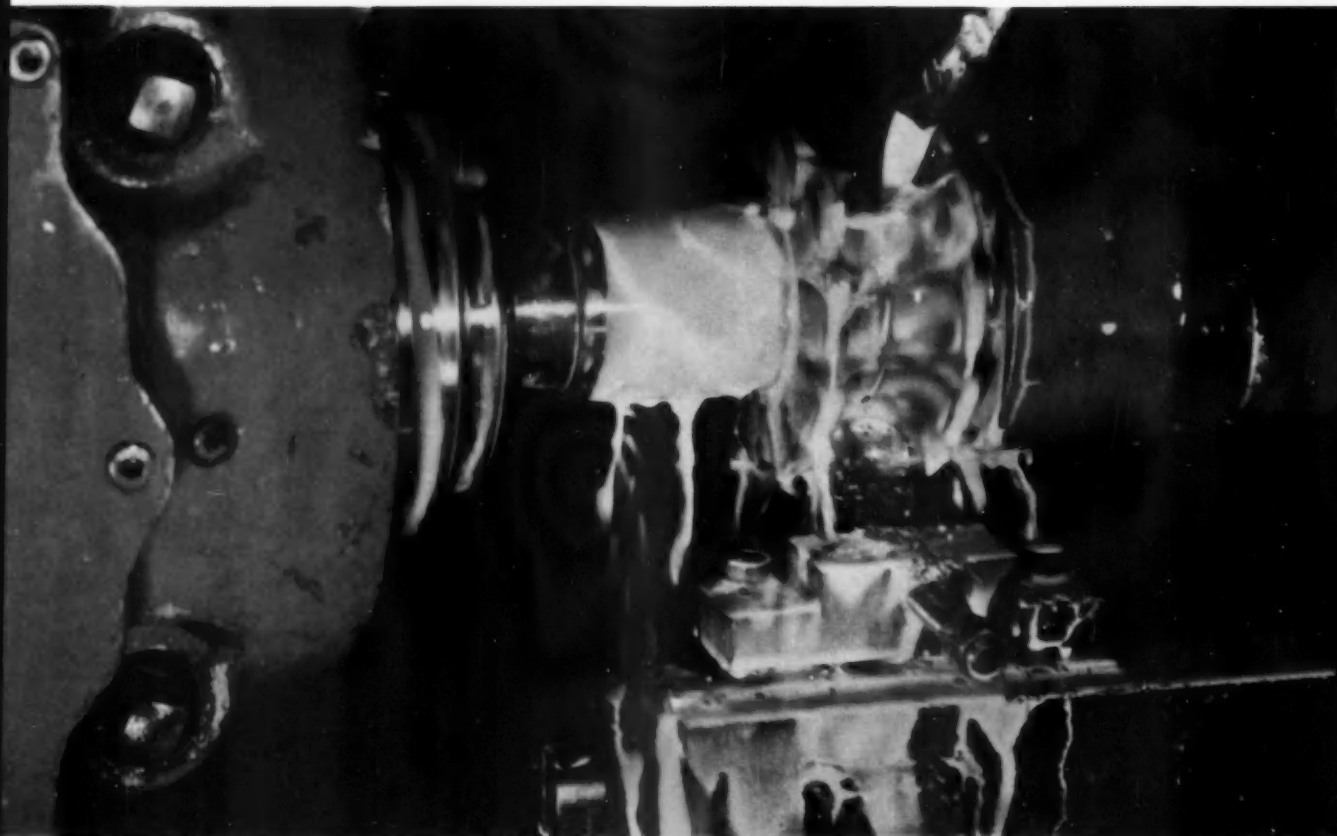
Detroit, Mich.  
Niles, Calif.

• St. Joseph, Mo.  
• Windsor, Ont.

New Chemical Horizons for Industry and Agriculture



Wheels and machines stay cleaner with emulsions of new S.E.C.O. Also, finishes are better.



Emulsions of new S.E.C.O. allow faster cuts with less tool wear.

*Photos courtesy of  
Peter Salmon Co., Glenside, Pa.*

# NEW EMULSIFYING OIL KEEPS MACHINES CLEAN, PROTECTS AGAINST RUST, GIVES IMPROVED HARD-WATER EMULSION STABILITY

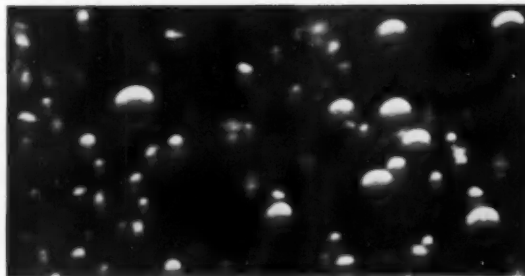
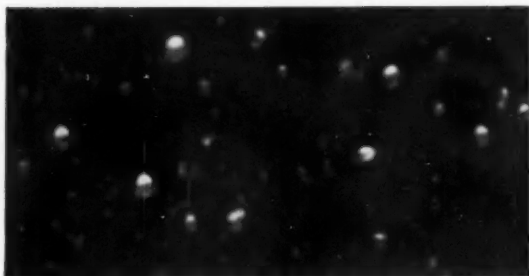
Emulsions of Sun's new S.E.C.O. (Sunoco® Emulsifying Cutting Oil) with smaller oil particle size give you the following benefits—

**EMULSION STABILITY**—In hard-water areas, impartial field tests show that emulsions of *new* S.E.C.O. stand up better under more severe conditions than those made with other regular emulsifying cutting oils.

**DETERGENCY**—The excellent wetting properties and detergency of *new* S.E.C.O. allow dirt and fines to settle quickly out of emulsions. Grinding wheels and machines stay cleaner.

**RUST-PREVENTION**—The smaller oil particle size in emulsions of *new* S.E.C.O. gives better metal wetting properties and increased protection against rust and corrosion. See photos below.

If you're a regular user of S.E.C.O., notice how much it has been improved. If you're not, find out what we mean about greater economy and improved production with *new* Sunoco Emulsifying Cutting Oil. Call your Sun representative, or write to Sun Oil Company, Philadelphia 3, Pa., Dept. I-9.



800x photomicrographs of 10% emulsions. *New* S.E.C.O. emulsion on left contains 8 times as many oil particles per unit volume as ordinary emulsion on right. Many minute particles in S.E.C.O. emulsion do not show at this magnification.



INDUSTRIAL PRODUCTS DEPARTMENT  
**SUN OIL COMPANY** Philadelphia 3, Pa.

IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL

©Sun Oil Co., 1958

# Tru-Stop Brakes

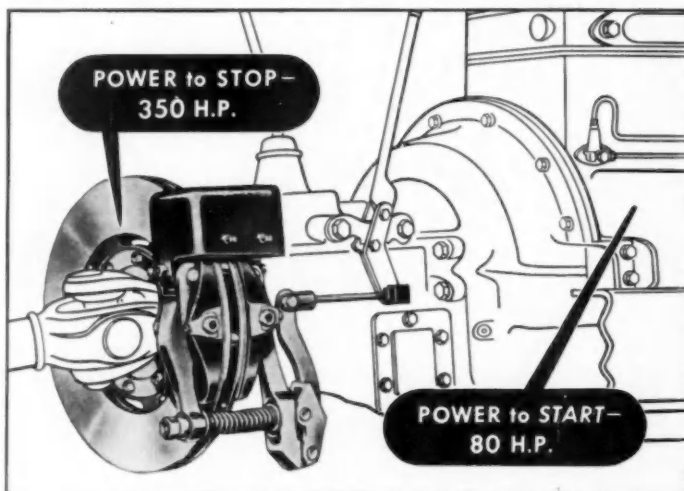
## Meet Every Heavy-Duty Safety Requirement

**OFFER POSITIVE PROTECTION  
AGAINST RUNAWAY OR PARKING  
ACCIDENTS—AT LOWEST COST**

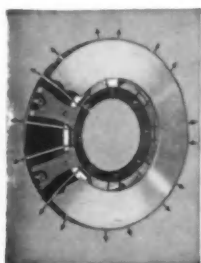
### HERE IS WHY:

**They have surplus power  
required for emergency  
service—no dangerous  
self-energizing**

TRU-STOP Heavy-Duty Emergency Brakes are not only excellent parking brakes. They serve as a complete, independent and fully reliable braking system. Operating on the propeller shaft they enable the driver to continue on safely in the event of service brake failure. TRU-STOP brakes have the surplus braking capacity to be used repeatedly as an auxiliary to service brakes.

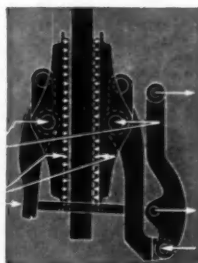


*Brakes actually do more work than the engine in terms of horsepower. Where it takes 80 HP to accelerate to 20 miles per hour, it takes 350 HP to make a safe stop from 20 miles per hour within required limits.*



### Ventilated to throw off heat

Brake efficiency depends on ability to throw off intense heat—rapidly. Discs of TRU-STOP brakes are exposed to the air even during the braking operation. Ventilated design circulates air between the disc plates.



### Give uniform brake pressure

Disc of TRU-STOP brakes is "squeezed" between the flat surface of the shoes. Effort applied to brake lever operates front and rear lever arms simultaneously. Pressure is exerted on the center of each shoe. Entire lining surface is in contact.

## FOR SAFE, ECONOMICAL, HEAVY-DUTY BRAKING WITH MAXIMUM LIFE AND MINIMUM MAINTENANCE

TRU-STOP Brakes are used on a great variety of mobile and stationary equipment

### SUCH AS—

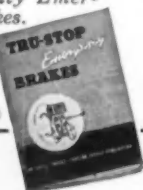
Motor cranes  
Road rollers  
Dump trucks  
Power dividers  
Cooling tower fans  
Oil well pumps  
Cold header presses  
Scrubbing machines  
Wire rope stranders  
Fork lift trucks  
Motor scrapers

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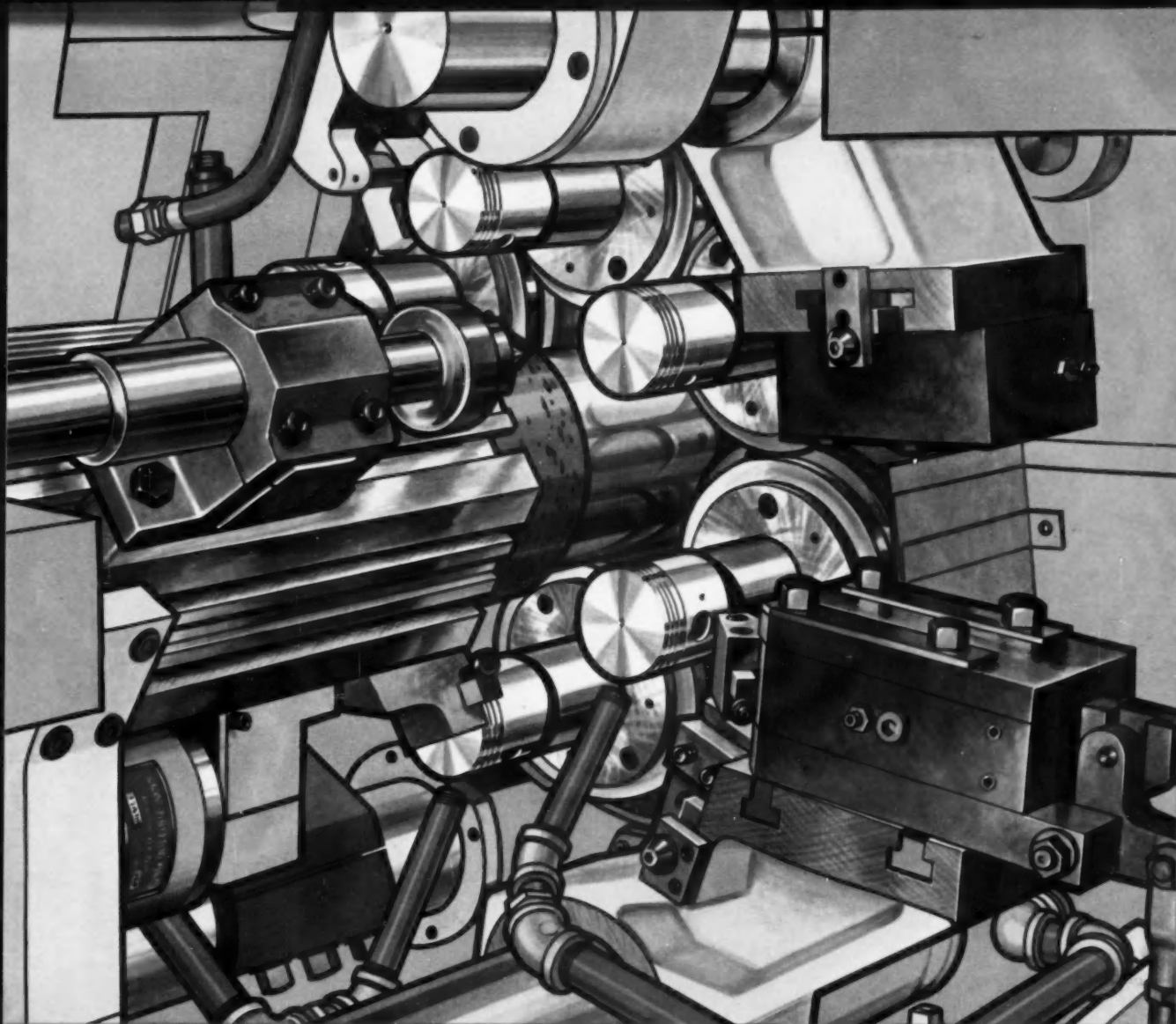


## Automotive and Aircraft Division AMERICAN CHAIN & CABLE

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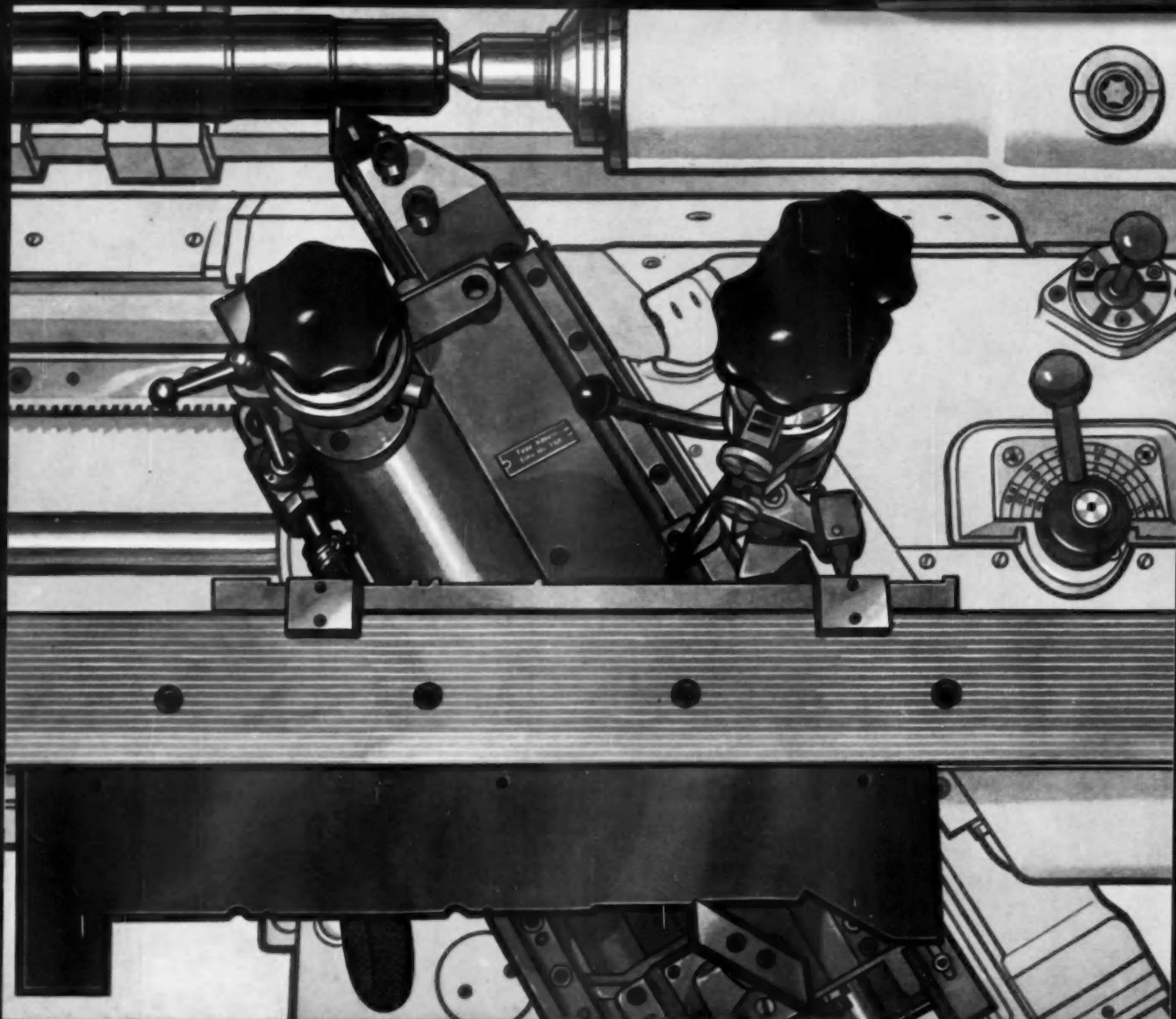


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**A** New Britain four-, six- or eight-spindle chucker with open-end design, massive forming arms, large capacity (up to 15") will machine your castings and forgings faster at less cost. You can measure it in *income* instead of *cost* because New Britain Chuckers pay as they go. New Britain's new financing plan makes large initial investment unnecessary. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



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**W**ith a New Britain **+6F+** Copying Lathe you outproduce gang tool setups because you cut at maximum speeds and feeds for tool efficiency. No tool-wear worries! The single tool is changed in one minute. Every dimension is positively transmitted from template to work, making adjustment a simple matter of bringing one dimension to size — the others *have* to be right. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



NEW BRITAIN **+6F+** COPYING LATHE

# Coordination Between Engineering and Manufacturing

(Continued from page 65)

as well as styling layouts to determine how to cut the cab into panels of such size and proportions that they can be adapted to existing or planned facilities and produced economically. In addition, the panels must be made sufficiently compact for efficient handling and shipping since they must be transported to assembly plants throughout the USA.

Following preliminary cost studies engineering proceeds with experimental layouts and detail drawings. At this stage Production Engineering literally looks over the designers' shoulders and brings in the proper manufacturing people; or makes appointments for engineers to go to the various plants with rough sketches, layouts, or models of components to determine how they should be designed for optimum production.

At this stage too it is often necessary for a plant manager, his master mechanics and processing groups to meet with design and production engineers to thrash out a particular problem. It may also be necessary to call in representatives of outside manufacturers in connection with parts that may be purchased.

By now the design engineer has a good knowledge of what is required and is in a position to issue building work orders for experimental parts. Many experimental parts or unit assemblies are built in manufacturing plants to make the manufacturing personnel familiar with the design in its experimental stages. Engineering cost estimates are compiled at this point, a sizeable Cost Estimating department being maintained by Engineering for this purpose.

A mock-up is built to check on general arrangements, clearances and placement of other components. This is helpful for study on the part of Assembly Plant personnel.

The Program Planning Group (in engineering) compiles a sched-

ule of experimental releasing, building, and testing. Lead times were determined early in the program and form the basis for all schedules.

Following Proving Ground testing Chevrolet arrives at the final design stage. As final production drawings are prepared, the Production Engineering Staff takes over to place the design in the hands of Manufacturing. This is the most important phase of liaison between Design and Manufacturing. Changes must be expedited quickly. Designers are taken into the plants to resolve problems with tool designers.

About three months before the start of production the Manufacturing department sets up a pilot assembly line to resolve assembly problems. Production Engineering participates actively in this operation and design engineers are called in frequently.

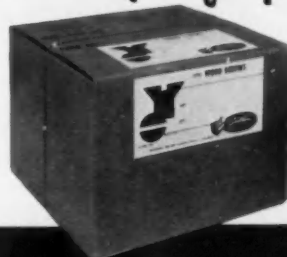
Production begins in the manufacturing plants and the Production Engineering group is then on the alert for problems in actual manufacturing. Most of the Chevrolet plants have a resident engineer and the larger ones an engineering staff to work closely with design engineers.

Next follows the start of production at the Assembly Plants. Many of the design engineers and sometimes some of the drafting room people go with the production engineers to the assembly plants to assist manufacturing in getting the lines started.

When vehicles are delivered to dealers and into the hands of customers, the Production Engineering field staff works with the Service Department field organization to resolve problems arising in the field.

The Production Engineering staff also maintains extensive test equipment in the plants and works constantly toward product improvement, cost reduction, and source development. Manufacturing co-

## SOUTHERN SCREW'S NEW BULK PACK SAVES YOUR SPACE ...it's designed for you!



If space is a problem in your materials movement and storage, Southern Screw's new bulk packing system offers MULTIPLE SPACE—AND TIME-SAVING ADVANTAGES AT NO EXTRA COST TO YOU, regardless of the size of your operation.

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operates closely in this work and also conducts studies to improve their own methods.

### Cummins Engine Co.

How the problem of communications between engineering and manufacturing is met at Cummins Engine Co. was described by George Hollins. At Cummins the procedure for launching a new design or major redesign is informal and is handled cooperatively through three major divisions: Research, Engineering, and Operations. The latter consists of the Manufacturing, Quality Control, Purchasing, and Personnel areas.

As projects are cleared by management, the design engineer takes over and develops the new design in rough form for Engineering and Management review. This provides the basic design for hard-lining and detailing of drawings. It is at this point that coordination of Engineering-Manufacturing takes hold. As the detailing of design progresses the engineers call in or consult with Manufacturing to determine whether the design can be produced by existing machinery, as well as changes that might be required to facilitate production on existing machinery. Or if new tools or methods are indicated, Manufacturing is called in to enable them to assign an individual to begin preliminary contacts for the procurement of such new equipment.

Subsequent to field qualification it is desirable to make a limited production run of the new parts. At this time Engineering and Manufacturing representatives review the design closely since that is the last opportunity for making changes or modifications before going into production.

After the new design is in production the production engineer in the Engineering Division, who is basically a liaison engineer, works between the Engineering and Operations division to take care of day-to-day problems.

### Thompson Products, Inc.

Consider now the case of a parts maker producing components exclusively. This is exemplified by

# MOLDED FIBER GLASS\*



\* MOLDED FIBER GLASS is the exclusive trade name for fiberglass reinforced plastic products custom molded by the Molded Fiber Glass Body Company.

Every year, more and more automotive manufacturers are turning to tough MOLDED FIBER GLASS to spruce up designs . . . speed up styling changes . . . slash total costs. Because, from drawing board to production, MOLDED FIBER GLASS parts require only half the time, and tools cost only one-fifth as much as for metal parts. And if your production requirements are 25,000 or less . . . you'll save money by using MOLDED FIBER GLASS parts.

MOLDED FIBER GLASS can be molded into shapes which you can't make with metal. Complex, deep-

draw parts can be molded in one piece . . . pigmented in any color, or painted.

Besides all this . . . MOLDED FIBER GLASS makes automotive parts better, because:

1. MOLDED FIBER GLASS combines high strength with light weight.
2. It's impact resistant . . . returns to original shape after heavy impact.
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Do you have an application  
for this remarkable material?

Write today for detailed information.



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the Michigan Division of Thompson Products, Inc., producing steering linkages and their components. As described by B. E. Ricks, the liaison between Engineering and Manufacturing has been made as simple as possible by physically locating Product engineering and Manufacturing engineering side by side in the same area.

It may be noted that the chief engineer in this plant is in complete control of the product from the experimental stages to the

production tooling stages. Both Product and Manufacturing engineering are under his jurisdiction.

Meetings are held between the heads of these departments on every major engineering design problem. Tooling and production standards are settled at this stage before the design is frozen.

To illustrate the system of communications here, consider a new product as presented by Experimental Engineering while the development is in its early stages.

At this point information on the new product is presented to Sales, Tool Design, Estimating, Industrial engineering, and Product engineering. A cost estimate is made to determine the extent of new capital equipment where needed. This establishes a starting point for estimating the cost of the new product.

Product engineering and Manufacturing engineering then work as a team to suggest and prove alternate designs that might incorporate changes such as a shift from forging to a stamping, for example. Such recommendations are made to reduce new tooling expenses and make better use of existing equipment.

This cooperative effort is informal but quite effective. Proposed designs are walked through to Manufacturing engineering so as to discuss the project while it is in the talking stage, making a product engineer available for the purpose of discussion. If Manufacturing engineering is not satisfied at any point, they call in the heads of Product engineering and the factory to resolve the matter. This procedure usually settles the problem. But if higher authority is required, they will call in the chief engineer and the vice-president of the Division to make the decision.

In all of these operations Purchasing is in direct contact with Manufacturing engineering. Purchasing always checks with outside suppliers on the making of components against the cost estimates developed by the Division. At Thompson Products price invariably determines whether to Make or Buy.

### Dana Corp.

What of the problems of a parts maker. The system approach at the Dana Corp. was described by R. R. Burkhalter. Dana has a multi-plant operation producing such components as transmissions, clutches, universal joints, and axles. A combination of divisionalized Manufacturing and Product engineering results in coordination of both areas on an intimate basis since the products are well defined



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Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from 1/8" to 1" inclusive. Available in brass or steel. Sizes generally required for L-P Gas service have approval of Underwriters' Laboratories.

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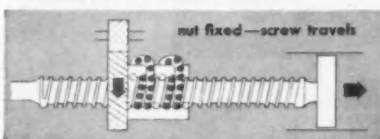
ACTUATE OR POSITION IT  
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# SAGINAW <sup>b/b</sup> SCREWS

6 decisive advantages reduce  
manufacturing problems and costs:



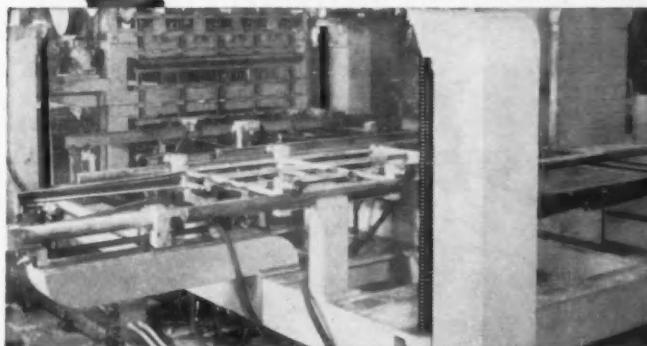
**FORWARD:** When rotary motion is applied to the screw, the b/b nut is driven along the axis of the screw, changing rotary motion to linear motion.



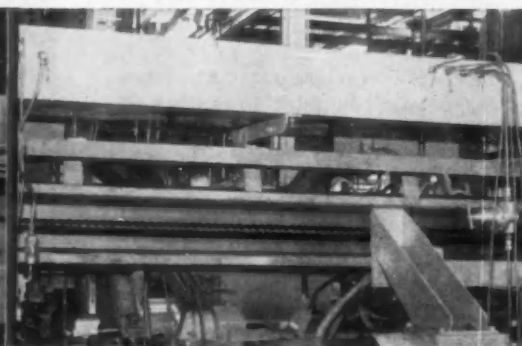
**FORWARD:** When rotary motion is applied to the b/b nut, the screw is driven along its longitudinal axis, changing rotary motion to linear motion.

- 1 POWER SAVINGS.** Operating with over 90% efficiency, Saginaw b/b Screws permit much smaller motors with far less drain on electrical systems, and also simplify circuitry.
- 2 SPACE SAVINGS.** Saginaw b/b Screws themselves are compact. They permit smaller motors and gear boxes and eliminate auxiliary equipment required by hydraulics.
- 3 DEPENDABLE PERFORMANCE.** Saginaw b/b Screws are far more reliable than hydraulics or pneumatics. Gothic arch grooves, yoke deflectors and multiple circuits provide added assurance.
- 4 PRECISE POSITIONING.** Saginaw b/b Screws will position components far more precisely than hydraulics or pneumatics; tolerances on position are held within .0006 in./ft. of travel.
- 5 TEMPERATURE TOLERANCE.** Normal operating temperature for Saginaw b/b Screws is from -75°F. to +275°F. But in selected materials, they will function efficiently at temperatures as high as +900°F.
- 6 LUBRICATION.** If lubrication fails the Saginaw b/b Screw will still function with remarkable efficiency. Units have been built and qualified for operation without lubrication.

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Automatic device for loading and unloading machine.  
Saginaw b/b Screw used to save power and space.

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and are completely divisionalized.

At Dana the Manufacturing personnel serve as consultants to the designers while a new design is being created so as to take full advantage of existing equipment and tooling; also to take advantage of the latest process techniques. Product engineers, in turn, serve as consultants to Manufacturing on new developments concerned with equipment and processes. In this manner both Manufacturing and Engineering are aware of proposed new products, new processes, and new equipment.

In addition to the day-to-day routine liaison work, regular monthly product division meetings are held with representatives of Engineering, Manufacturing, and Top Management. At this meeting all major developments are reviewed and if any policy decisions are required they can be made on the spot by top management executives.

Dana also has a Staff Estimating group, including cost analysis, charged with the responsibility for determining if a part can be purchased more economically than it can be manufactured. This group is also instrumental in gathering and presenting data on optional designs such as—the use of forgings, stampings, or castings. They also review Manufacturing requests for design changes on existing parts before such changes are incorporated on drawings. When dealing with cost reduction problems, this group assigns a product engineer to work as a team with purchasing and process engineers.

## Clark Equipment Co.

Operation of flexible task force committees provides the communication between Engineering and Manufacturing in the Automotive Division of Clark Equipment Co. Functioning of this scheme was described by C. H. King, vice-president and general manager of the division, by means of a case study.

The case in point is the air suspension system launched by the company some short time ago. The

(Turn to page 124, please)

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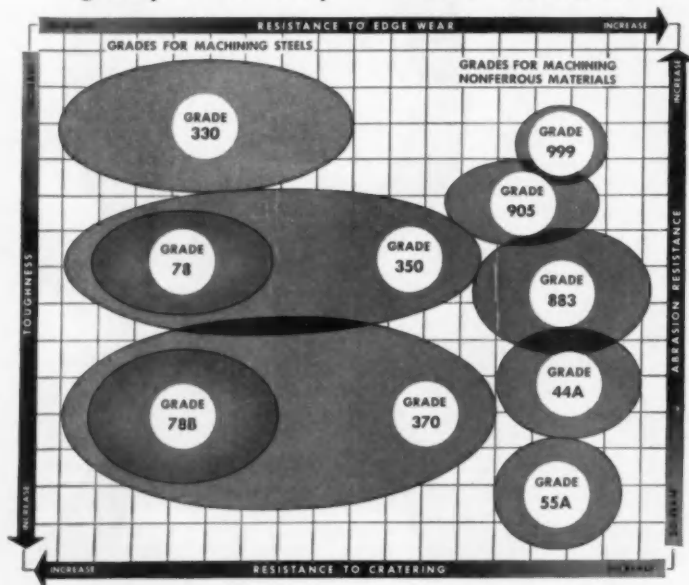
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CEMENTED CARBIDES

**GENERAL  ELECTRIC**

## Coordination Between Engineering and Manufacturing

(Continued from page 120)

case study begins at the point where engineering samples have been built and tested, preliminary cost estimates made, and a market research report filed with Management.

The general conclusion was that the product was good but the

assembly was too heavy and would cost too much in a competitive market. At this point the vice-president of the division called together the key personnel from Sales, Engineering, Manufacturing, Purchasing, Standards, and Cost Analysis. Here the facts were

presented and it was concluded that redesign would be required to reduce weight by 25 per cent, and reduce cost by 30 per cent without affecting the operational characteristics of the suspension system.

The next step was to appoint a committee to study the problem and report back at some set time. The committee in this instance was composed of a cost analyst, product engineer, purchasing representative, and methods engineer. This committee, typical of the general attack on problems, requires aggressive, cooperative people with the initiative to accomplish the desired result. Usually the cost analyst makes a good secretary and leader since all information flows to him from the others in the group.

In the usual course of events progress was slow at the start while everyone concerned was evaluating the problem and breaking it down to the specific areas in which improvement can be made. Eventually the sample system was torn down and the components spread out for easy examination. Then representatives from the foundry, forge, sheet metal, and machine shop, as well as qualified vendors were called in for counsel as to ways and means of reducing cost and weight.

After several weeks of such activity the committee reported that the requirements—25 per cent reduction in weight and 30 per cent reduction in cost—could be met. Moreover, the committee came up with suggestions for an alternate construction for part of the suspension which promised an additional saving of 15 per cent in weight and a further reduction of five per cent in cost, if the suggestion could be safely accepted after extended testing.

At Clark the method outlined above is employed either formally or informally on every product before it goes into production.

### International Harvester

How are communications established in a large motor truck operation? A very interesting picture of how it is done by International Harvester Co. was presented by C. B. Sheering, general supervisor



## HAUL HEAVIER LOADS

NEW THREE LEVER DESIGN

LIGHTER WEIGHT—SHALLOWER

SMOOTHER, QUIETER OPERATION

AVAILABLE IN 10", 10.5", 11" SIZES

ARCH TYPE CONSTRUCTION  
FOR BETTER VENTILATION

SELF ADJUSTING—MINIMUM  
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Count on Firestone's complete new facilities for low-cost, mass produced parts and trim for automotive products and home appliances.

Brightening a product or part with aluminum trim? Trying a new texture or tint? Whatever you want — from small panels to part sizes up to seven feet long — you'll get it first, and you'll get it *Fashionized* at Firestone. For Firestone teams almost 50 years of experience in metal fabri-

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of the Divisional Planning Department.

Management at Harvester has become increasingly aware that close and effective liaison between Engineering, Manufacturing, Purchasing, and Sales is mandatory in developing competitive products. The availability of purchasing, manufacturing, sales, and accounting counsel to engineering permits development of designs which provide maximum adaptability to current conditions and takes into ac-

count the need for effecting future modifications with a minimum of expenditures.

Divisional Planning, organized some six years ago, is headed by the general supervisor and his assistant who report directly to the vice-president and general manager of the Division. The staff of this group is assigned as follows:

I. A *Sales Consultant and Assistant*, directly responsible to the manager of Sales, but assigned to Divisional Plan-

ning to keep Engineering and Manufacturing advised regarding Sales requirements in new releases, to screen proposed new designs for salability, and to review current requests for special features, etc.

II. A group of *Manufacturing and Design Consultants and Estimators* to collaborate with the Engineering Department and Works personnel regarding the effects of proposed design changes on present Plant and Equipment facilities, tooling requirements, etc., as related to stampings and sheetmetal assembly, forgings, heat treating and castings, gear cutting and general machining, and engine, axle, transmission and end product (final) assembly.

III. A *Purchasing Consultant and Assistant*, who are constantly in contact with current and potential suppliers as well as manufacturers of new materials and components.

IV. *Two Cost Consultants and Assistants*, who develop preliminary cost estimates on new product designs, based on calculations submitted by the Manufacturing and Design Estimators, and on quotations from suppliers. This group also develops and presents target costs of proposed new models, features or modifications for Management consideration.

V. A *Production Research Coordinator*, who maintains close liaison with the Manufacturing Plants and with Engineering, primarily in relation to product cost improvement projects.

VI. An *Office Methods Consultant and Assistants*, whose chief responsibility is to develop and adapt efficient procedures for disseminating information throughout the Divisional operations by means of Electronic Data Processing systems.

(Turn to page 130, please)

## the best costs less

Simplicity is the word for ROOSA MASTER fuel injection pumps. Small in size and weighing less than 10 pounds, there are fewer parts to service, fewer adjustments, which means lower service costs.

Only one model size is adaptable for either a 2, 3, 4, 6 or 8 cylinder engine. Compare its initial cost and installation cost for further proof that the best costs less.

HMS

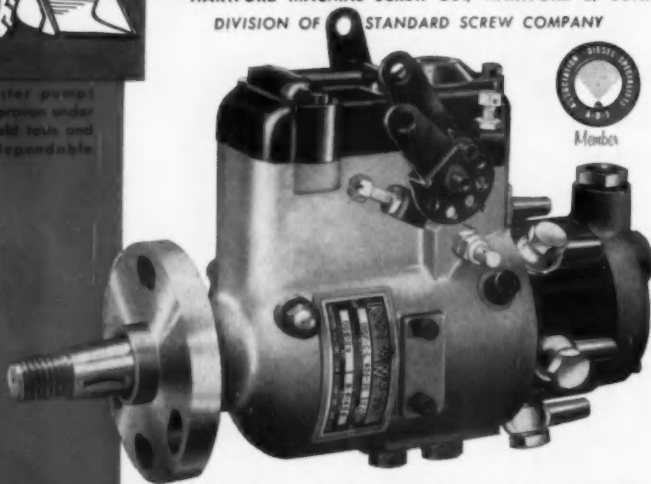
ROOSA MASTER

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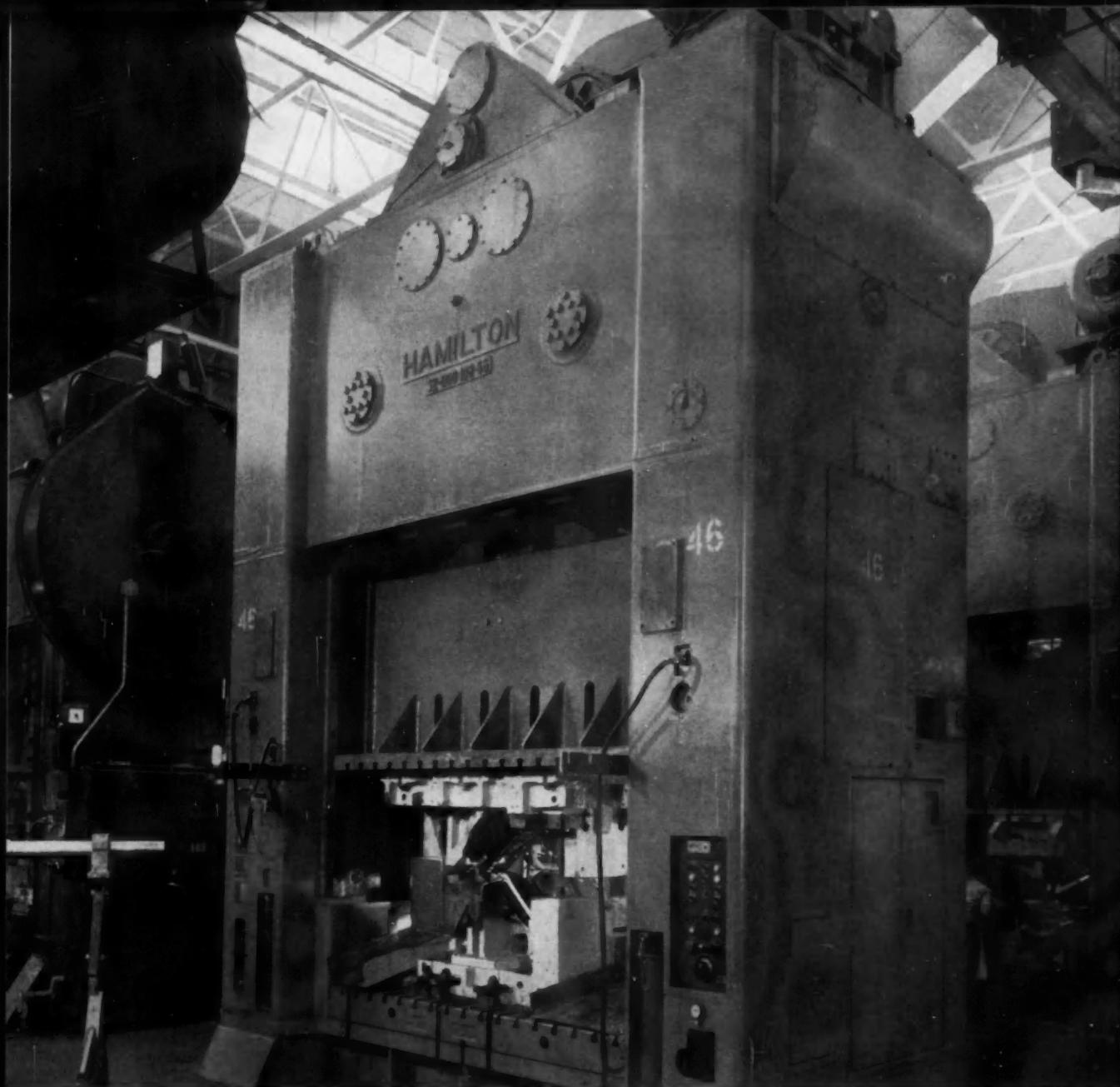
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DIVISION OF STANDARD SCREW COMPANY



Roosa Master pumps have been proven under extensive field tests and years of dependable service.



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This versatile 600-ton Hamilton Eccentric Gear Press is currently turning out a wide variety of parts in a major automobile plant in Detroit.

## Why an eccentric gear press?

Hamilton Eccentric Gear Presses are ideally suited for heavy duty operations—particularly deep draws and other stamping operations where the tonnage is encountered well up on the stroke.

The eccentric and gear are integral and rotate on

a short eccentric pin, as a result of which torsional and bending loads are negligible.

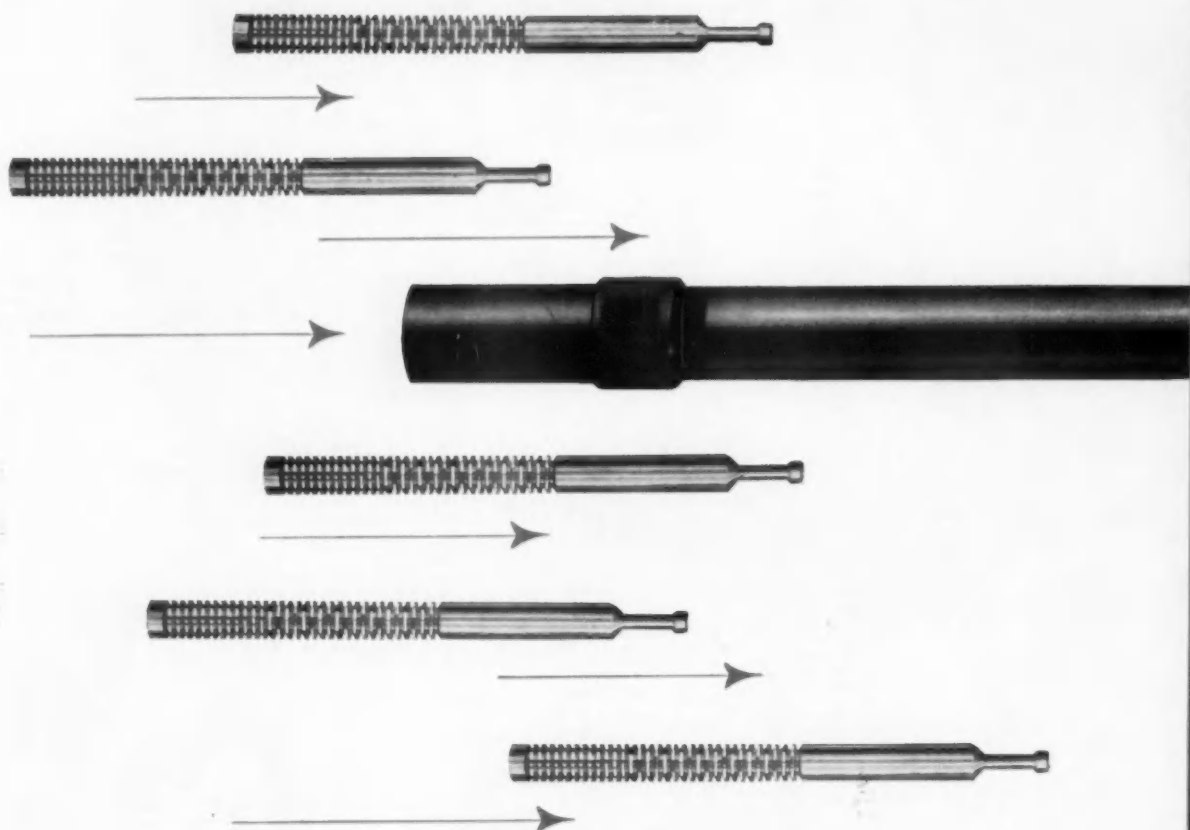
The many added features of Hamilton Eccentric Gear Presses guarantee greater production, improved stamping quality, and lower maintenance costs.

*Write to Dept. 7E for Bulletin #13301, describing these machines*

**Hamilton Division** Hamilton, Ohio  
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Now you can take a 9-pound portable hydraulic tool to the work and finish round holes to tolerances as close as .0002" in a matter of seconds. This new and highly productive method is preferred over reaming because of its greater accuracy and lower labor and tooling costs. Round holes *are really* round and meet every standard for size, concentricity, squareness of bore axis with face, absence of taper, and bell mouth. In addition, round pilot holes are quickly converted to square, hex, oval, splined or keyed shapes . . . and hole walls are "mirror finished". Capacity: 3/16" to 5/8" diameter holes.



CP Hydraulic Portable Broach Pullers draw the broach through a predrilled pilot hole. An automatic chuck grabs the broach shank at the beginning of the operation and releases it on completion. A stream of air cleans cuttings as the broach emerges from the hole.

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CP-805-ARDR Power Cell — Hydraulic power for the Broach Gun is provided by the CP-805-ARDR Pneumatic Power Cell. This compact, carryable 58-pound unit operates from conventional shop air lines and provides controlled oil pressures up to 7000 p.s.i. for actuating broaching guns and many other types of hydraulic tools.

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## Coordination Between Engineering and Manufacturing

(Continued from page 126)

VII. An Engineering Release Coordinator and several Release Analysts, whose job it is to thoroughly screen all final Engineering Drawing and Specification Releases to insure that design is in accord with the concept approved by Management and is in

accordance with procedural requirements to permit ready processing at Works level.

VIII. Stenographic and additional clerical help which bring the Departmental roll to 35 persons.

Perhaps the most important con-

tribution of the group to improved economy is found in the continual searching-out processes in the pre-production stages. As new designs are conceived in the Advanced Engineering Section, collaboration between design engineers and the consultants of the Group wring out answers to questions such as the following:

Will the design satisfy customer demand?

Can it be produced economically with present plant and equipment facilities?

Can present tooling be modified, or is new tooling required?

Should it be manufactured or purchased?

Will new methods and/or materials reduce the cost?

Correct answers to these and many other questions, determined in the very early design development stages, tend to insure a final production release which will flow smoothly into economical manufacture.

Another area of cost improvement is the research into improved methods and new or improved materials for the current product. In this connection Divisional Planning coordinates the efforts of the Work's Purchasing, Planning, and Production Research with Product engineering and Engineering Research and Development.

• • •

### Zinc Die Castings

Rumor has it that one of the fine car builders plans to return to a zinc die-cast grille. If true, it will take a really big casting. Incidentally, some recent work indicates the possibility of employing a modified electroplating procedure that will provide a lasting chromium-plated finish free from corrosion.

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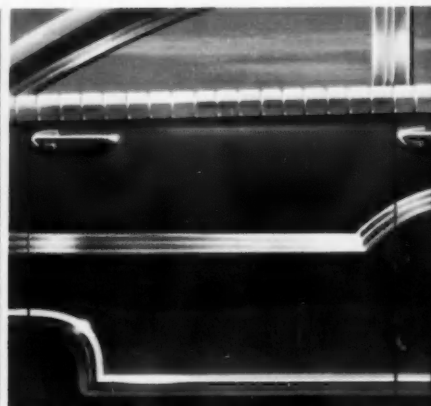
## BEAM PRODUCTS MFG. CO.

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WRITE FOR COMPLETE INFORMATION

On CARS. too ... "handsome is  
as handsome does" ...

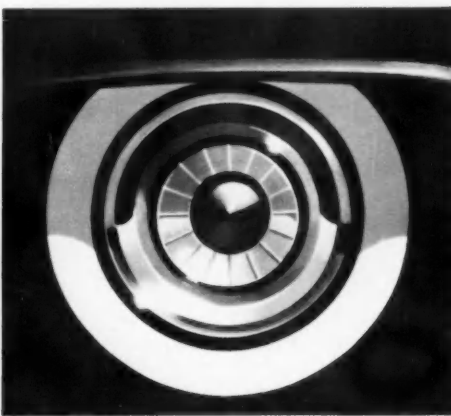
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beautiful **Stainless Steel**  
does a car-saving job for you



stainless moulding protects body paint from  
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permanently attractive



stainless wheel covers resist abrasion, stones and  
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stainless provides solid protection for easily-marred  
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stainless brightens  
the entire car  
for life!



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**First to be specified  
by America's  
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It's a known fact that many leading Original Equipment Manufacturers submit their original specifications for their first quotation to Eastman.

EASTMAN's unequalled experience in hydraulic conversion, plus many original designs shown in a few popular Eastman fittings at the right—give your product an appearance of quality that improves its competitive position in your field. It's a mark of distinction to be Eastman equipped!

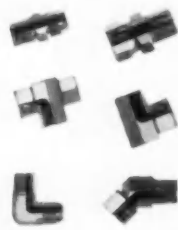
## **EASTMAN Engineering Service . . . Backed by Unequalled Experience**

It is also a known fact that Eastman's co-operative engineering counsel and service is highly respected and often requested by leading OEM's. Let Eastman engineers help you lay out your fluid power lines—from pump to point of work—effecting economies in design, improving performance and increasing user satisfaction.

Let EASTMAN recommend the best assembly . . . for the best performance . . . at the lowest cost.



Bent Tubing with the necessary fittings to meet your own specific requirements.



Adapters, Adapter Unions and Boss "O" Ring Fittings. All types and sizes available.

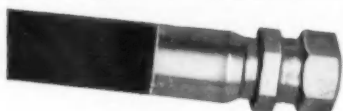
## **A COMPLETE LINE OF HYDRAULIC FITTINGS and HOSE ASSEMBLIES...**



Permanently Attached Male (NPTF) for 1, 2 and 3 wire braid rubber cover hose, and 4 spiral wire extra high pressure hose.  
Sizes:  $\frac{3}{16}$ " thru 3".  
Wkg. pressure: 375—5000 p.s.i.



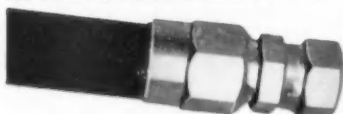
Permanently Attached Male Flare (JIC) for 1, 2 and 3 wire braid rubber cover hose.  
Sizes:  $\frac{3}{16}$ " thru 2".  
Wkg. pressure: 375—5000 p.s.i.



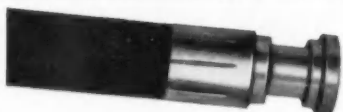
Permanently Attached Swivel Female for 1, 2 and 3 wire braid rubber cover hose.  
Sizes:  $\frac{3}{16}$ " thru 2".  
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Reusable Male (NPTF) for rubber and cotton cover hose.  
Sizes:  $\frac{3}{16}$ " thru  $1\frac{1}{16}$ ".  
Wkg. pressure: 375—5000 p.s.i.



Reusable Swivel Female for rubber and cotton cover hose.  
Sizes:  $\frac{3}{16}$ " thru  $1\frac{1}{16}$ ".  
Wkg. pressure: 375—5000 p.s.i.



Permanently Attached Flanged Head Couplings for 1 and 2 wire braid rubber cover hose.  
Sizes:  $\frac{1}{4}$ " thru 2".  
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Clamp Type Coupling with split flange stems for 1 and 2 wire braid rubber cover hose.  
Sizes:  $\frac{1}{4}$ " thru 2".  
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Power Steering Assemblies to meet all your requirements.



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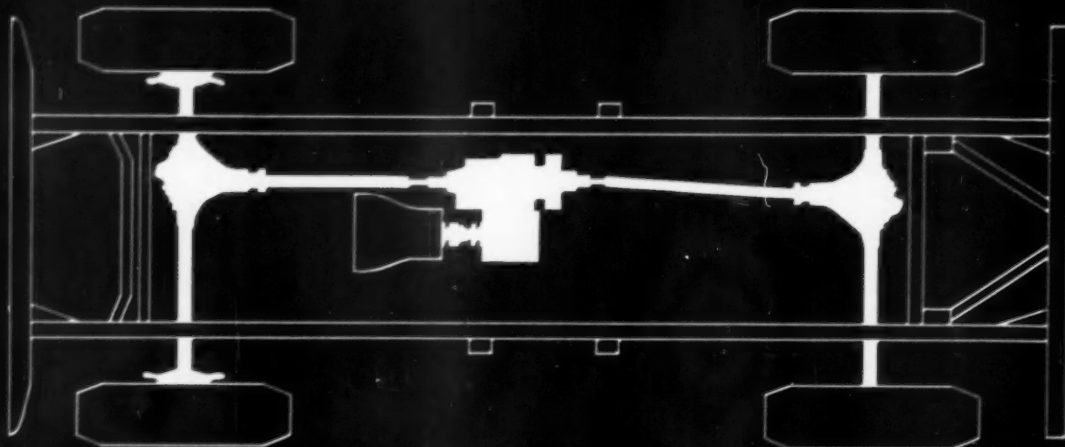


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Four-Wheel Drives...**  
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It's power-matched . . . and, that's the big advantage of the Spicer four-wheel drive assembly. For only Spicer can offer you front and rear driving axles, transfer cases and propeller shafts that were designed to work together.

And, you're assured of durability and quality by Spicer's record of producing 90% of the light-weight four-wheel drives in use throughout the world.

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#### DANA PRODUCTS Serve Many Fields:

**AUTOMOTIVE:** Transmissions, Universal Joints, Propeller Shafts, Axles, Four-Let Differentials, Torque Converters, Gear Boxes, Power Take-Offs, Power Take-Off Joints, Clutches, Frames, Forgings, Stampings.

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*Many of these products manufactured in Canada by Hayes Steel Products Limited, Hamilton, Ontario*





Government officials are pointing out to small firms facing rough times that metal stampers—aided in some instances by geographic factors—have prospered and successfully bucked the merger trend by research which resulted in better products.

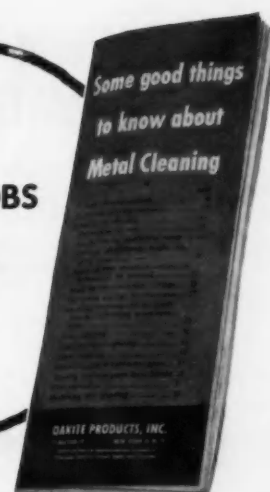
Senate leaders are under considerable pressure from labor lobbyists to "forget" about union reform bills. Most Democrats and Republicans would rather see the whole issue of union corruption put off until 1959, which is not an election year.

Senate Majority Leader Lyndon Johnson is trying hard to avoid a vote on such touchy issues as the so-called "democracy in unions" proposal. This would require the election of union officials by secret ballots marked by rank and file union members. (Very few unions have this. The United Steel Workers is an outstanding exception.)

Senate Minority Leader William Knowland is challenging the Senate to vote the democratic process proposal either up or down. But it looks as though he's outnumbered. Quite a few of his Republican colleagues are running for re-election and have no wish to antagonize labor leaders back home. As a result, it begins to look unlikely that labor legislation of any importance will emerge from the Congress this year.

Switch to missile and rocket warfare is playing hob with the military standardization program. Navy, for instance, reduced its inventories by 95,000 items last year through standardization. But addition of new missiles and complex electronic gear more than offset the savings, spokesmen admit. New items are entering the Navy's buying lists at the rate of 150,000 a year.

## WHICH METAL-CLEANING JOBS WOULD YOU LIKE TO IMPROVE?



- ☐ Are you cleaning metal in the most economical way? See page 9 of Oakite's FREE booklet on Metal Cleaning.
- ☐ Are you cleaning metal the fastest way? See page 12.
- ☐ Do you need room-temperature cleaning combined in one operation with temporary rustproofing? See pages 12 and 14.
- ☐ Do you know the advantages of alkaline pickling? See page 21.
- ☐ Have you compared the values of iron phosphate coating and zinc phosphate coating in preparation for painting? See pages 22 and 25.
- ☐ Can you use a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? See page 30.
- ☐ Do you have trouble stripping epoxy resins, pigment residues, phosphate coatings and under-paint rust? See page 31.
- ☐ How do you clean parts that are too large to be soaked in tanks or sprayed in machines? See page 31.
- ☐ Are you getting full profit out of your finishing barrels? See page 32.
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- ☐ Do you need better protection against rusting in process or in storage? See page 37.

**FREE** For your copy of "Some good things to know about Metal Cleaning" write to Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.



Technical Service Representatives in Principal Cities of U.S. and Canada  
Export Division Cable Address: Oakite

# World Trade Emphasized at NMTBA Spring Meeting

(Continued from page 71)

materials are available. It is desirable to speak the language. Look, further, for availability of qualified workmen in area. The European common market may be an important reason for locating on the Continent. Some may be faced with

a dual market—England and the Continent. Serious consideration to the possible impact of the common market is thought to be important.

Question: Are different selling techniques needed abroad? An-

swer: You have to justify the differential in price, but the basic techniques are about the same. High quality effort, in quantity, is needed to effectively sell overseas. Some companies have carefully-trained American personnel working with foreign dealers, and feel they do the best job. Foreign countries do have some restrictions in makeup of plant personnel. Do not train foreigners, if utilized, by remote control—bring them here.

Question: Is the method of allowing a sales discount, usually 15 per cent, desirable on foreign shipments? Answer: It is considered preferable to use this money on sales effort and promotion.

Question: What else can be done to promote foreign sales? Answer: You must know the market—what the users require, and how you can best adapt the machines to meet their problems. Ways and means for reducing the manufacturing costs of the machine tools should be looked into constantly—to make the products more attractive price-wise not only in the foreign market, but in the domestic market as well. Overall, it appears, first, that there is no substitute for familiarity with the European market. And second, the highest quality and maximum quantity of sales manpower definitely does result in increased ability to sell in Europe today.

Given in the following are extracts from reports on the German and British machine tool industries, presented at the meeting by association members:

## The British Cutting Tool Industry

By John J. Prindiville, Jr.

President, The Lapointe Machine Tool Co.

The British machine tool industry (that is the metal cutting part of it) is quite a small one considering its importance to the British. Small, I should say by comparison with the engineering industry as a whole . . . mechanical, electrical, marine and automotive. It has a labor force of about 48,500, recruited with some difficulty. Its total output was about 95 million pounds in 1957, and likely to be 100 million pounds in 1958.

Ninety-five per cent of this output is produced by 130 factories. The rest of it comes from about 200 fac-



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"Prescription Power" with a Lamb Electric Motor means—

- ... a motor designed to the exact requirements of your product . . .
- ... built-in dependability that results from 42 years of small-motor experience . . .
- ... favorable cost because our plant is geared to produce custom-made quality on a volume basis.

May we demonstrate these advantages of Lamb Electric Motors to you?

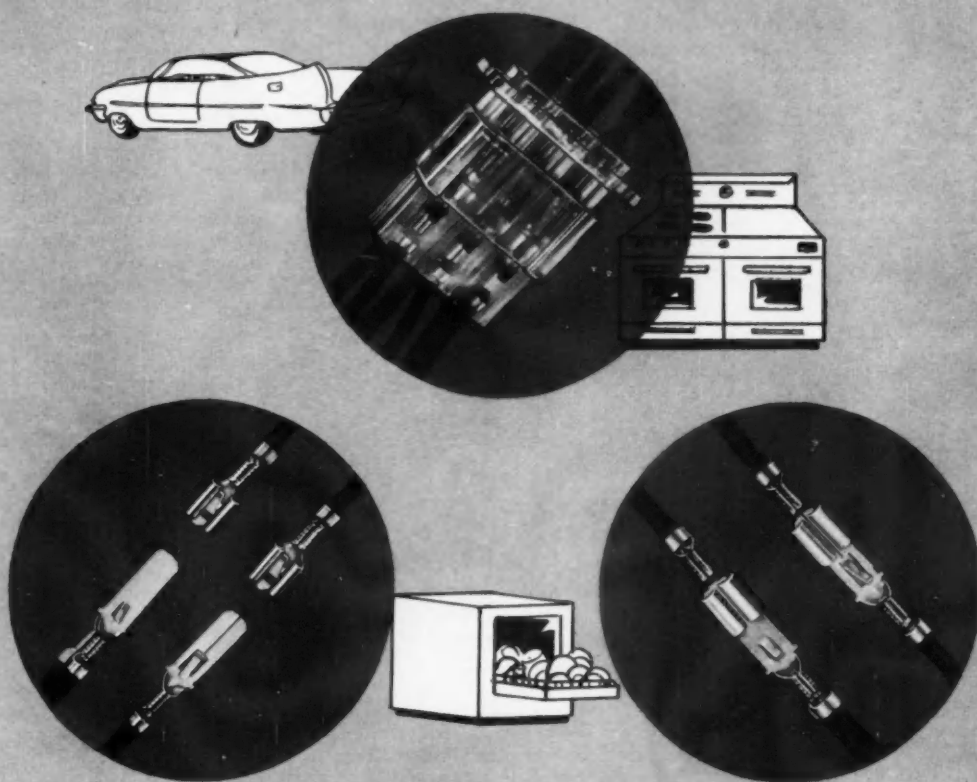
**THE LAMB ELECTRIC COMPANY • KENT, OHIO**

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FRACTIONAL HORSEPOWER **MOTORS**



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The NEW **AMP** FASTIN-FASTON Harness Connector . . .  
. . . VIBRATION RESISTANT • VERSATILE • COMPACT**

- For appliance and automotive wiring, Fastin-Faston saves time, money, trouble . . . in both designing and production.
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- Connects up to six separate circuits when polarized unit is snapped together.
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- Uses quick, easy-to-apply Faston Terminals. Housing is fabricated of nylon for superior mechanical and electrical performance. UL approved.

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For more than forty years car manufacturers have been using Thermoid Products. The experience gained from this long association has helped Thermoid research, development and production processes keep pace with the recognized progress of the automotive industry. This is one of the reasons why you specify the "safest thing on wheels"—when you select Thermoid Brake Linings.



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Other high quality Thermoid Products.  
Modernized to meet modern driving conditions.



Radiator Hose



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tories whom we can almost disregard; they're either large manufacturers with a small machine tool department, or firms in an entirely different field who make an occasional tool to order.

Peak year for the British machine tool industry was 1956. In that year, they had about 18 months' orders in hand. That was the average delivery time. Today, delivery is down to nine months, largely because the first big wave of expansion is over. Right through the British engineering industry, the market is settling down to its normal expansion and replacement program.

The British cannot live without exports, and their government watches the situation like a hawk. In point of fact, machine tool exports dropped from a healthy third of their total production, to just about a quarter. Now they are climbing back, as a result of prompt government action.

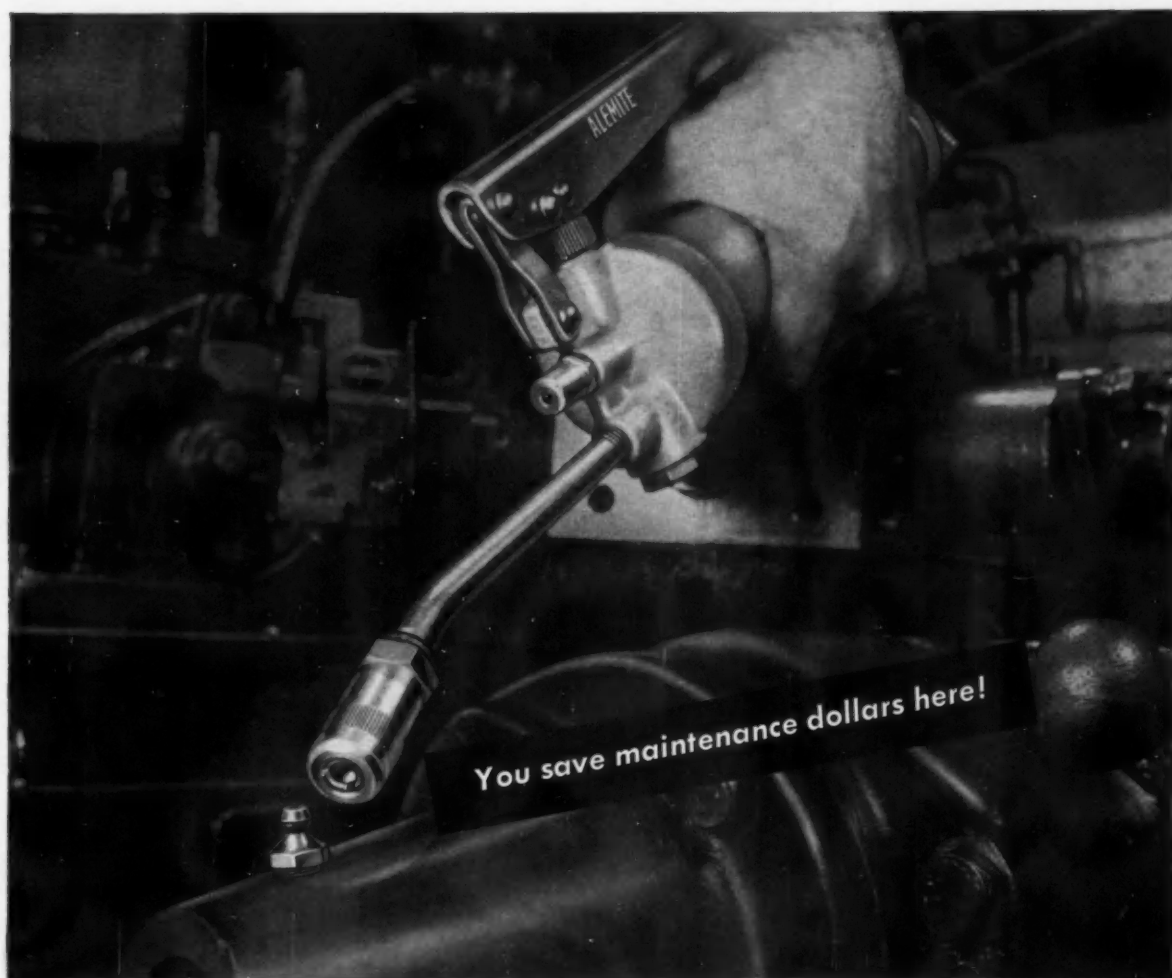
Now let's take a quick look at England's overseas market for machine tools. Australia buys most, at the rate of four million pounds per annum. India comes next; and the United States shares third place, with two other countries, as England's biggest customers for machine tools. Canada, France, Spain, South Africa, Russia and Western Germany also take substantial quantities.

And now let's take a look at the foreign competition. I think this will interest you, because—to an English exporter—we are foreign competition. And I'd like you to see how we make out.

The U. K. does, indeed, face severe competition from many countries. But not so much from the U. S. A. because—although we have the largest machine tool industry in the world—our prices are high by comparison. On top of this, most countries are suffering from a dollar shortage. So the U. K. is in a favorable position.

However, the U. K. has two serious competitors in Western Germany and Russia. At one time, Western Germany was way down the list; now she's ahead of Britain. As for Russia, it's difficult to make comparisons; the kind of statistics that Russia issues are not easy to apply. But her output is probably bigger than Western Germany's; and her potential is fast approaching our own.

There's another factor in German competition I'd like to mention before I leave this subject. A very high proportion of her plants are entirely new; if they're not, they were probably re-tooled during the war. While England was straining to produce



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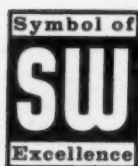
The point of lubrication is where maintenance costs can be cut—providing you have the right equipment for the job!

This heavy-duty Alemite hand gun—combined with genuine Alemite lubrication fittings—brings up to 10,000 lbs. of pres-

sure to even ordinary lubrication points. It gives you power to spare for fast, efficient, money-saving protection of every machine in your plant!

Gun handles all regular pressure gun greases. Long operating handle for maximum lever-

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existing types right up to 1956, German designers were working on completely new machines.

You might say "Why don't British machine tool builders do something about it?" "Why don't they produce at war-time level?" The answer is—they haven't got the labor. During the war they had the help of the two other branches of the engineering industry—manufacturers of printing machinery and textile machinery. These were the only people with heavy machining capacity. Today, even this help is not available.

On the contrary, other branches of engineering are competing for our labor. Take the automobile industry, for example, and its suppliers. Or take the aircraft industry—that's a perfect example. They have rich development contracts for military and civil aircraft. They can offer rewards to designer draftsmen that we cannot compete with.

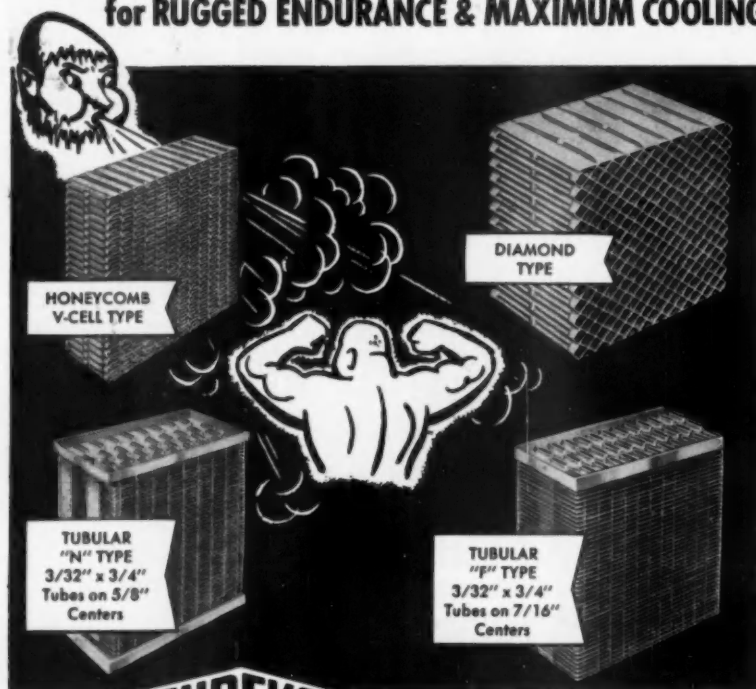
Well, that's the darker side of the picture for the U. K. builder of machine tools. You'll be surprised now when I say that their output is still increasing—both in volume and in

value. Increasing, in spite of rising costs, difficult supplies and labor problems.

There have been some changes in the financial structure of the industry in Britain. I don't want to go too deeply into these, though they do affect overall productive capacity. Some small machine tool companies have been taken over by larger ones: some by large engineering firms, and some by industrial concerns in an entirely different field.

But one trend that is worth noting is this. Many established import companies are forming manufacturing subsidiaries to produce machine tools under license. Most of these tools are of American design, formerly beyond the reach of U. K. users, because of the dollar shortage. Not only this. The British-made equivalent can be offered at a far lower price than the American original.

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### The German Machine Tool Industry Today

By Ralph J. Kraut

1st Vice President, NMTBA, and  
President, Giddings & Lewis Machine Tool Co.

I believe it appropriate to start with 1948 because the events of the last 10 years are all part and parcel of the German machine tool industry as we know it today.

The Allies during 1948 lifted the ban on production of machine tools in Germany—prompted as much, I believe, by the then new Russian threat as anything. The German plants were not caught by surprise. Most of the rubble had been cleaned up; temporary roofs and boarded-up windows kept out the weather; many of the remaining machine tools, that our Government experts had labeled as scrap, were already cleaned up and reconditioned into usable shape; some inventory had been accumulated by barter and financial legerdemain; designs were ready. In addition, the drastic currency reform gave a stable national financial base.

After the running start of 1948, the German machine tool industry entered a period of phenomenal growth. The first recorded output—that of 1949—showed less than 360,000,000 DM, considerably below pre-war. As near as I can estimate, the physical output represented by this figure would be \$120 million—I use 2.5 DM to the dollar for this purpose, the official rate of 4.19 DM to the dollar (Turn to page 143, please)

MEMO

Tom: You ask why  
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Retaining Rings?  
well—  
Here are just a few reasons

No groove "pop-out" problems  
here, Tom. That SPIROLOX  
is in there to stay!

Tom note:  
Full circle  
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surface!

Reusable, too!  
No loss of  
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or holding  
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savings!

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failures, solved our  
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and saved us  
assembly  
time!

PISTON PIN  
RETAINER  
(Internal use example)

Know how I put  
that ring in? With  
a screwdriver! Know  
how I can get it out?  
With a screwdriver!  
No special tools with  
SPIROLOX, Tom—easy  
in, easy out!

See? Automatically locks  
itself in the groove under  
thrust. Can't wind or unwind!

Here's a retaining job for  
you! Resists thrust up to  
its own shear strength!

"ROLL-LOCK"  
CHUCKING TOOL  
(External use example)

—And how's THIS for  
a uniform shoulder?  
Uniform ring height, too!

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FOR ENGINEERING TEST

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aircraft swaging terminal

aircraft swaging to

WIRE NO.	WIRE SIZE	WIRE TYPE	WIRE DIA.	WIRE WGT.	WIRE L.	WIRE R.	WIRE S.	WIRE T.	WIRE U.	WIRE V.	WIRE W.	WIRE X.	WIRE Y.	WIRE Z.	WIRE AA.	WIRE AB.	WIRE AC.	WIRE AD.	WIRE AE.	WIRE AF.	WIRE AG.	WIRE AH.	WIRE AI.	WIRE AJ.	WIRE AK.	WIRE AL.	WIRE AM.	WIRE AN.	WIRE AO.	WIRE AP.	WIRE AQ.	WIRE AR.	WIRE AS.	WIRE AT.	WIRE AU.	WIRE AV.	WIRE AW.	WIRE AX.	WIRE AY.	WIRE AZ.	WIRE BA.	WIRE BB.	WIRE BC.	WIRE BD.	WIRE BE.	WIRE BF.	WIRE BG.	WIRE BH.	WIRE BI.	WIRE BJ.	WIRE BK.	WIRE BL.	WIRE BM.	WIRE BN.	WIRE BO.	WIRE BP.	WIRE BQ.	WIRE BR.	WIRE BS.	WIRE BT.	WIRE BU.	WIRE BV.	WIRE BW.	WIRE BX.	WIRE BY.	WIRE BZ.	WIRE CA.	WIRE CB.	WIRE CC.	WIRE CD.	WIRE CE.	WIRE CF.	WIRE CG.	WIRE CH.	WIRE CI.	WIRE CJ.	WIRE CK.	WIRE CL.	WIRE CM.	WIRE CN.	WIRE CO.	WIRE CP.	WIRE CQ.	WIRE CR.	WIRE CS.	WIRE CT.	WIRE CU.	WIRE CV.	WIRE CW.	WIRE CX.	WIRE CY.	WIRE CZ.	WIRE DA.	WIRE DB.	WIRE DC.	WIRE DD.	WIRE DE.	WIRE DF.	WIRE DG.	WIRE DH.	WIRE DI.	WIRE DJ.	WIRE DK.	WIRE DL.	WIRE DM.	WIRE DN.	WIRE DO.	WIRE DP.	WIRE DQ.	WIRE DR.	WIRE DS.	WIRE DT.	WIRE DU.	WIRE DV.	WIRE DW.	WIRE DX.	WIRE DY.	WIRE DZ.	WIRE EA.	WIRE EB.	WIRE EC.	WIRE ED.	WIRE EE.	WIRE EF.	WIRE EG.	WIRE EH.	WIRE EI.	WIRE EJ.	WIRE EK.	WIRE EL.	WIRE EM.	WIRE EN.	WIRE EO.	WIRE EP.	WIRE EQ.	WIRE ER.	WIRE ES.	WIRE ET.	WIRE EU.	WIRE EV.	WIRE EW.	WIRE EX.	WIRE EY.	WIRE EZ.	WIRE FA.	WIRE FB.	WIRE FC.	WIRE FD.	WIRE FE.	WIRE FF.	WIRE FG.	WIRE FH.	WIRE FI.	WIRE FJ.	WIRE FK.	WIRE FL.	WIRE FM.	WIRE FN.	WIRE FO.	WIRE FP.	WIRE FQ.	WIRE FR.	WIRE FS.	WIRE FT.	WIRE FU.	WIRE FV.	WIRE FW.	WIRE FX.	WIRE FY.	WIRE FZ.	WIRE GA.	WIRE GB.	WIRE GC.	WIRE GD.	WIRE GE.	WIRE GF.	WIRE GG.	WIRE GH.	WIRE GI.	WIRE GJ.	WIRE GK.	WIRE GL.	WIRE GM.	WIRE GN.	WIRE GO.	WIRE GP.	WIRE GQ.	WIRE GR.	WIRE GS.	WIRE GT.	WIRE GU.	WIRE GV.	WIRE GW.	WIRE GX.	WIRE GY.	WIRE GZ.	WIRE HA.	WIRE HB.	WIRE HC.	WIRE HD.	WIRE HE.	WIRE HF.	WIRE HG.	WIRE HH.	WIRE HI.	WIRE HJ.	WIRE HK.	WIRE HL.	WIRE HM.	WIRE HN.	WIRE HO.	WIRE HP.	WIRE HQ.	WIRE HR.	WIRE HS.	WIRE HT.	WIRE HU.	WIRE HV.	WIRE HW.	WIRE HX.	WIRE HY.	WIRE HZ.	WIRE IA.	WIRE IB.	WIRE IC.	WIRE ID.	WIRE IE.	WIRE IF.	WIRE IG.	WIRE IH.	WIRE II.	WIRE IJ.	WIRE IK.	WIRE IL.	WIRE IM.	WIRE IN.	WIRE IO.	WIRE IP.	WIRE IQ.	WIRE IR.	WIRE IS.	WIRE IT.	WIRE IU.	WIRE IV.	WIRE IW.	WIRE IX.	WIRE IY.	WIRE IZ.	WIRE JA.	WIRE JB.	WIRE JC.	WIRE JD.	WIRE JE.	WIRE JF.	WIRE JG.	WIRE JH.	WIRE JI.	WIRE JJ.	WIRE JK.	WIRE JL.	WIRE JM.	WIRE JN.	WIRE JO.	WIRE JP.	WIRE JQ.	WIRE JR.	WIRE JS.	WIRE JT.	WIRE JU.	WIRE JV.	WIRE JW.	WIRE JX.	WIRE JY.	WIRE JZ.	WIRE KA.	WIRE KB.	WIRE KC.	WIRE KD.	WIRE KE.	WIRE KF.	WIRE KG.	WIRE KH.	WIRE KI.	WIRE KJ.	WIRE KK.	WIRE KL.	WIRE KM.	WIRE KN.	WIRE KO.	WIRE KP.	WIRE KQ.	WIRE KR.	WIRE KS.	WIRE KT.	WIRE KU.	WIRE KV.	WIRE KW.	WIRE KX.	WIRE KY.	WIRE KZ.	WIRE LA.	WIRE LB.	WIRE LC.	WIRE LD.	WIRE LE.	WIRE LF.	WIRE LG.	WIRE LH.	WIRE LI.	WIRE LJ.	WIRE LK.	WIRE LL.	WIRE LM.	WIRE LN.	WIRE LO.	WIRE LP.	WIRE LQ.	WIRE LR.	WIRE LS.	WIRE LT.	WIRE LU.	WIRE LV.	WIRE LW.	WIRE LX.	WIRE LY.	WIRE LZ.	WIRE MA.	WIRE MB.	WIRE MC.	WIRE MD.	WIRE ME.	WIRE MF.	WIRE MG.	WIRE MH.	WIRE MI.	WIRE MJ.	WIRE MK.	WIRE ML.	WIRE MM.	WIRE MN.	WIRE MO.	WIRE MP.	WIRE MQ.	WIRE MR.	WIRE MS.	WIRE MT.	WIRE MU.	WIRE MV.	WIRE MW.	WIRE MX.	WIRE MY.	WIRE MZ.	WIRE NA.	WIRE NB.	WIRE NC.	WIRE ND.	WIRE NE.	WIRE NF.	WIRE NG.	WIRE NH.	WIRE NI.	WIRE NJ.	WIRE NK.	WIRE NL.	WIRE NM.	WIRE NN.	WIRE NO.	WIRE NP.	WIRE NQ.	WIRE NR.	WIRE NS.	WIRE NT.	WIRE NU.	WIRE NV.	WIRE NW.	WIRE NX.	WIRE NY.	WIRE NZ.	WIRE OA.	WIRE OB.	WIRE OC.	WIRE OD.	WIRE OE.	WIRE OF.	WIRE OG.	WIRE OH.	WIRE OI.	WIRE OJ.
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AUTOMOTIVE INDUSTRIES, May 15, 1958

## World Trade Emphasized at NMTBA

(Continued from page 140)

being meaningless—also German machine tool prices f.o.b. Works are approximately 60 per cent of ours.

Each year thereafter the output increased almost 50 per cent per year, until in 1952 it reached over 1,000,000,000 DM—equal to \$400 million of our output. This was the year of the great International Machine Tool Fair at Hannover, when the Germans so rudely jolted us with their many new designs and overall capabilities.

After 1952 the output of the German machine tool industry continued to increase every year, although at a slower rate. By 1957—last year—it had reached over 1,800,000,000 DM—equal to more than \$700 million of our own physical output.

Think of this figure a minute and relate it to the output of the American industry for 1957 of \$1,088,450,000—a country with a population of 30 per cent of ours producing 70 per cent of the machine tools that we do. Also compare these figures with the 1957 British machine tool industry output which I estimate at almost £100,000,000 (based on 10 month statistics)—equal to \$500 million of our output on a physical basis (using my estimating figure of a pound sterling at \$5.00).

Germany and Great Britain, with 100,000,000 population together out-produced the U. S. A. in machine tools, despite our population of 170,000,000.

Exports tell part of the story—Germany with 47 per cent; Great Britain with 26 per cent; and the U. S. A. with 11 per cent—but not all. These two worthy foreign competitors together did 78 per cent of our domestic shipments for their domestic customers—with less than 60 per cent of our population.

This leads me to the make-up of the West German machine tool industry. Their association, VDW, currently reports approximately 500 manufacturers, including both metal cutting and metal forming types, with a total employment of 87,000. This compares with an estimated 370 manufacturers in the U. S. A., employing approximately 70,000. It is interesting to note that the German employment figure includes almost 12,000 trainees and apprentices. For comparative purposes and as near as I can judge from figures I obtained in

(Turn to page 146, please)

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**CHROME PLATED CYLINDER BORES AND PISTON RODS** . . . Standard at No Extra Cost!

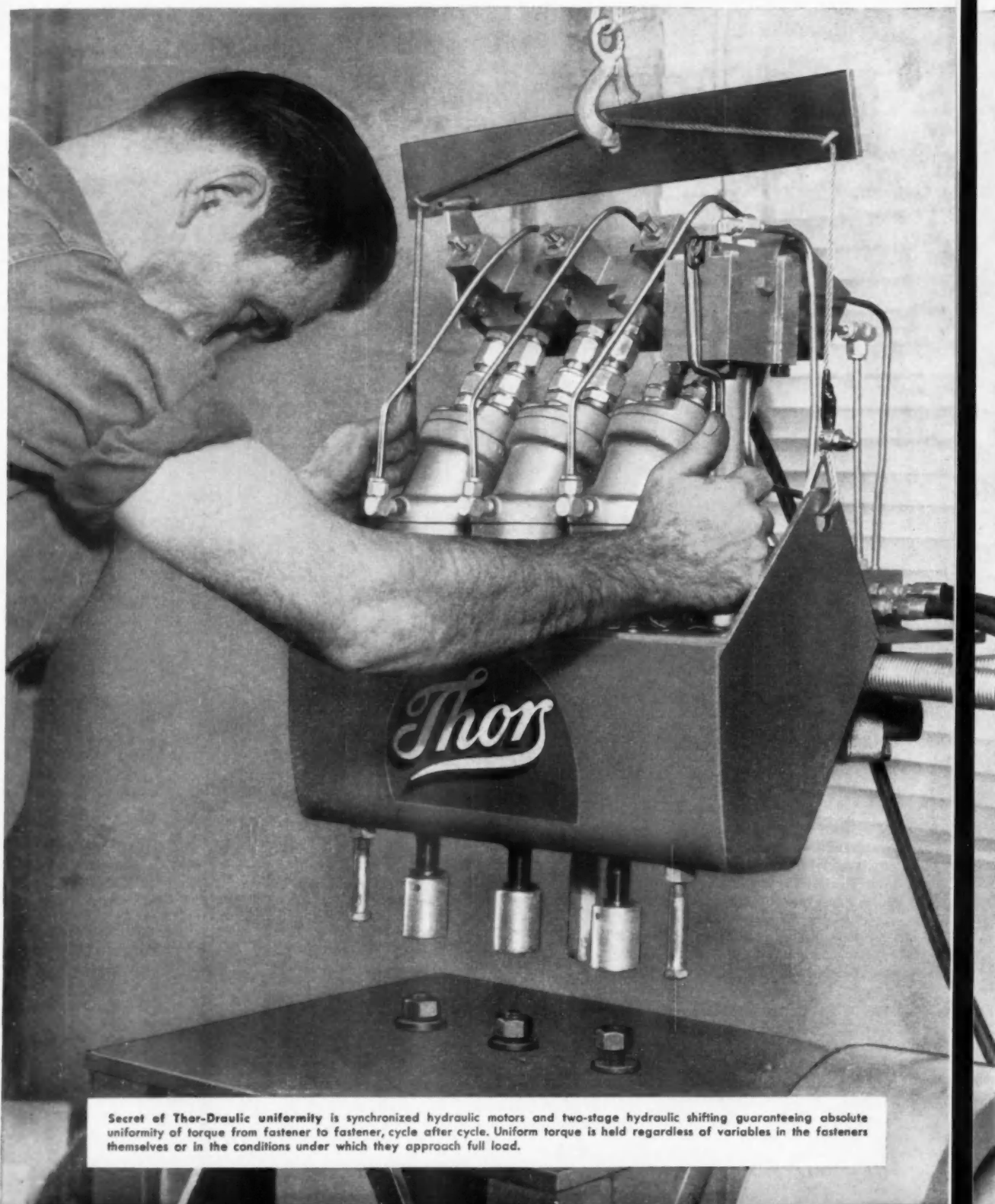
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Secret of Thor-Draulic uniformity is synchronized hydraulic motors and two-stage hydraulic shifting guaranteeing absolute uniformity of torque from fastener to fastener, cycle after cycle. Uniform torque is held regardless of variables in the fasteners themselves or in the conditions under which they approach full load.

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**REVOLUTIONARY • COMPLETELY HYDRAULIC  
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*Controls torque to plus or minus one foot pound*



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## World Trade Emphasized at NMTBA

(Continued from page 143)

London, the British machine tool industry has approximately the same number of manufacturers as the German, and the British employment is approximately 50,000.

One final point on the statistics relating to the German machine tool industry today. In 1957 almost 150,000,000 DM of machine tools were

imported into Western Germany, with approximately one-third from the U. S. A., one-quarter from Switzerland, and one-eighth from East Zone Germany. This represents imports of approximately eight per cent of Western Germany's own output of machine tools.

### Capabilities

It is quite evident that the German machine tool industry has a real capability of the volume production of almost all types of machine tools. Perhaps of greater significance to us

is that this output can be sold at selling prices ranging from 50 per cent to 60 per cent of what we are forced to charge (f.o.b. works). This stems essentially from the fact that German wage rates are less than one-quarter of ours, presently being in the area of 2.25 DM per hour (54¢ at the official rate) and from the fact that machine tools inherently have a high labor content.

In considering wage rates it might be well to discuss briefly the overall productivity of the German machine tool companies compared with ours.

I have found that the average efficient German machine tool plant produces almost 25,000 DM per employee per year. Placing this figure on a physical basis, considering the German industry's price structure, would result in a hypothetical output of almost \$12,000 per employee per year. By comparison I find that the better American machine tool companies produce approximately \$20,000 per employee per year.

Why then the apparent superiority of American productivity?

In the first place, most German machine tool plants are integrated to a greater extent than we, including foundry facilities and the production of many items that we would buy.

In the second place, the average German machine tool plant has almost 15 per cent of its total employment in trainees and apprentices—probably a necessity today because of wartime losses and rapid considerable growth—at any rate this figure is substantially higher than our own.

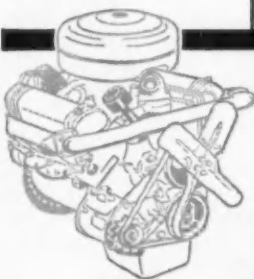
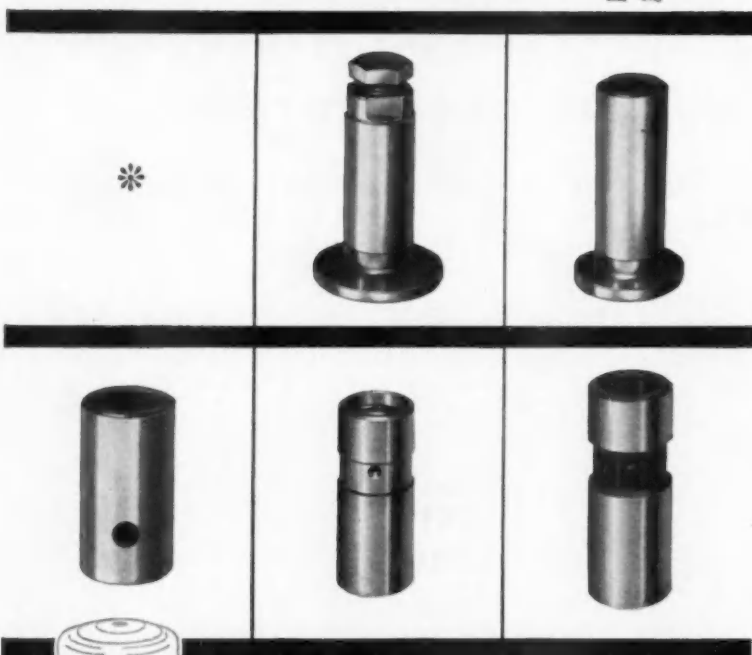
Third, it is evident that we use a greater amount of material handling equipment in the form of overhead traveling cranes, hoists, conveyors, etc.

Fourth, German design engineers are not taught to be quite as production conscious as ours, with the result that many German units are more costly in man hours to produce. Other factors would probably include production control, longer work hours, with resultant inefficiency, more problems with purchased items, shortages of management personnel, and the like.

I have often been asked about the relative quality of German machine tools as compared to American. I also well remember the sales axiom of never criticizing a competitor's products. In this instance, however, I should like to be perfectly frank.

In general, the designs of most of the better known German machine tools are excellent. I believe anyone who visited the 1952 and 1957 Han-

## JOHNSON *tappets*



*\* keep pace with today's engines*

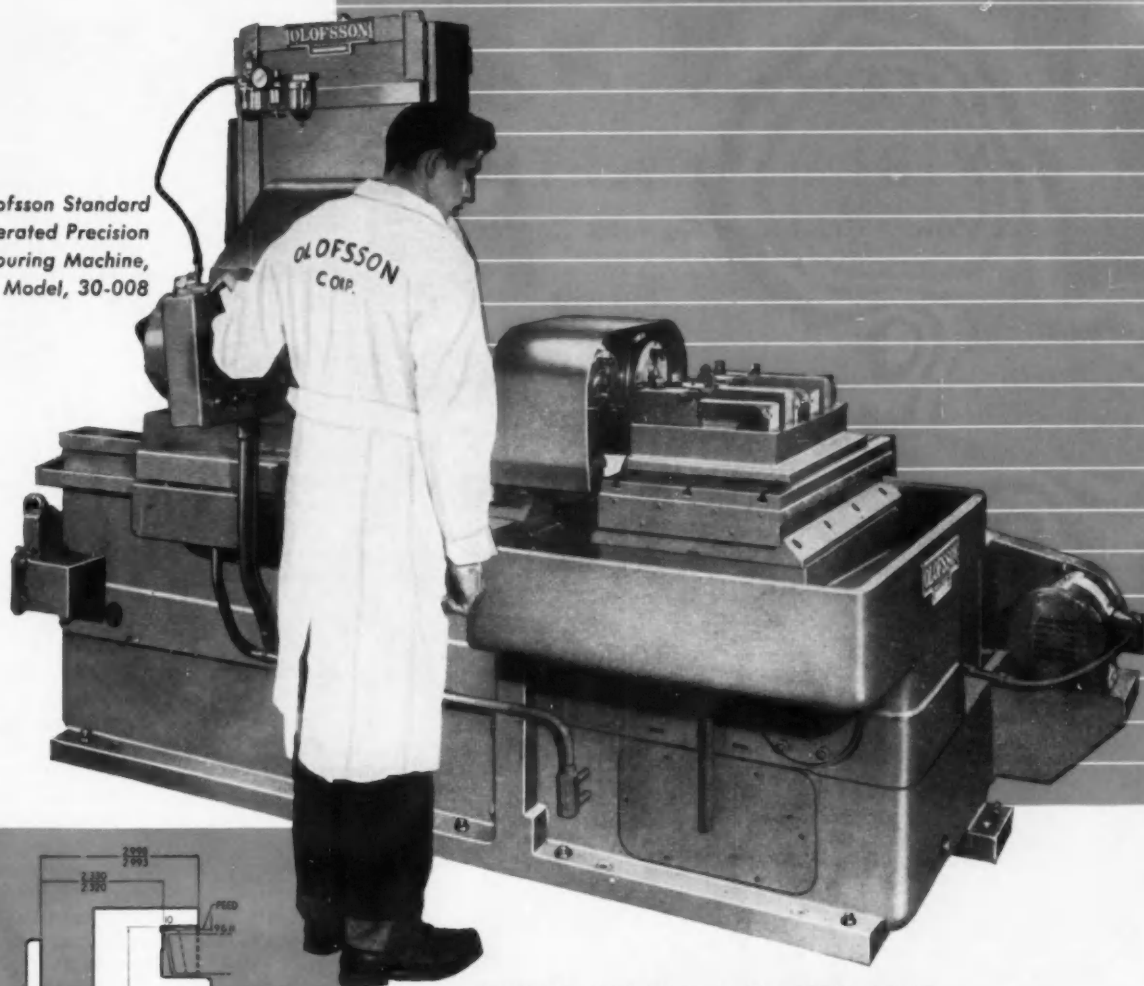
Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration.

Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

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Cam Operated Precision  
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DIRECT CAM ACTION for mechanical control of precision tolerances gives the Olofsson Contouring Machine fast and accurate control over a wide variety of contouring operations.

Cams are easy to change. For more dependable operation they're mounted on a heavy duty spindle in the machine base.

All motors and hydraulic controls are located outside the base. The heavy duty cross slide provides a substantial base for fixture tooling.

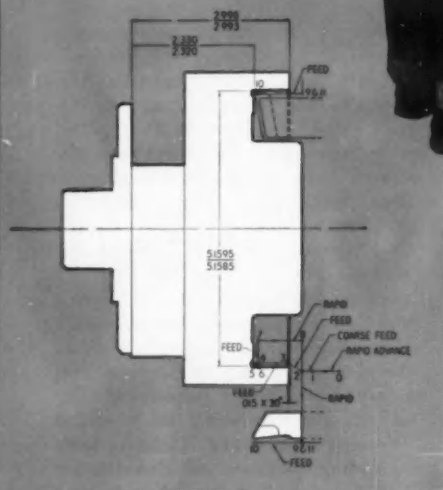
#### DESIGN FEATURES

- Direct Cam Action
- Low height to width ratio of spindles to ways.
- Automatically lubricated, hardened and ground V and flat ways.
- Both table slides, controlled by cams mounted on a single drive shaft.

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Boring Machinery.



#### A TYPICAL APPLICATION

The part: transmission rear brake drum.  
Material: pearlitic malleable iron.  
Operations Performed: boring, facing,  
chamfering and undercutting.  
Rate of Production: 70 pieces per hour.



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# ADVANTAGES OF FLEXIBLE SHAFTING

For Power Drive and Remote Control

by

C. Hotchkiss, Jr.

Application Engineer

Stow Manufacturing Company

Flexible shafting has the following advantages over other type drives:

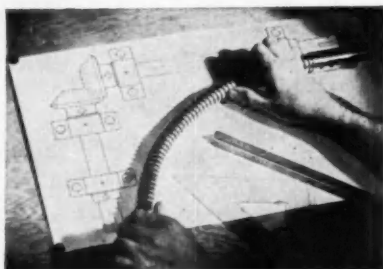
- 1—it is often the simplest method of transmitting power between two points which are not collinear or which have relative motion
- 2—eliminates exposed revolving parts
- 3—does not require accurate alignment
- 4—easy to install and maintain

**Not Collinear**—Where it is necessary to connect two shafts which are not collinear, a simple arrangement of a single belt or two universal joints will often do the job adequately. But, in many cases where the path of transmission is more complicated and would require a more expensive arrangement of mechanical components, flexible shafting provides a simple, low cost, efficient drive which is easy to install because it does not require accurate alignment. See example, figure 1, in which a 1½-inch Stow flexible shaft is used to drive the auger on a G.L.F. bulk feed truck.

Flexible shafting also allows the designer greater freedom in locating either the drive or the driven component on a piece of equipment.



Fig. 1



**Relative Motion** — Where two shafts which have relative motion must be connected, flexible shafting is often the ideal means of transmission. In many cases it eliminates a much more complicated drive which would, necessarily, include telescopic joints; further, it eliminates the danger of exposed moving parts. See figure 2, which shows a ¾-inch Stow flexible shaft driving an Avery Rake built by the Minneapolis Moline Co.



Fig. 2

Other typical applications of this type are used on portable power tools when motors are too heavy to be mounted on the tool—such as portable grinders, sanders, paint scrapers, saws and tree tappers. And, since flexible shafting is not affected by vibration, it is an ideal drive for applications where a high degree of vibration is involved—such as in vibration testing tables and concrete vibrators.

Stow flexible shafts are available: for power drive applications in diameter sizes from ½-inch to 1¼-inches; for remote control applications in diameter sizes from ¼-inch to 1½-inches. The 1¼-inch power drive shaft will transmit up to 10 HP while the 1½-inch remote control shaft will transmit up to 4000 lb. in.

For complete engineering data on flexible shafting, including selection charts, write for engineering bulletin 570.

never Fairs would agree with me. Nevertheless, I believe the American machines are still more trouble-free, more rugged, and somewhat simpler both for the operator and the maintenance man. Perhaps this stems as much from the fact that the American suppliers of castings, of steel, of bearings, of electrical equipment, etc., give us a better, more reliable product. The Germans, I believe are more prone than we to use what I call "gadgets" and "sales gimmicks." Nevertheless, we should never underrate the high German capabilities in engineering and research.

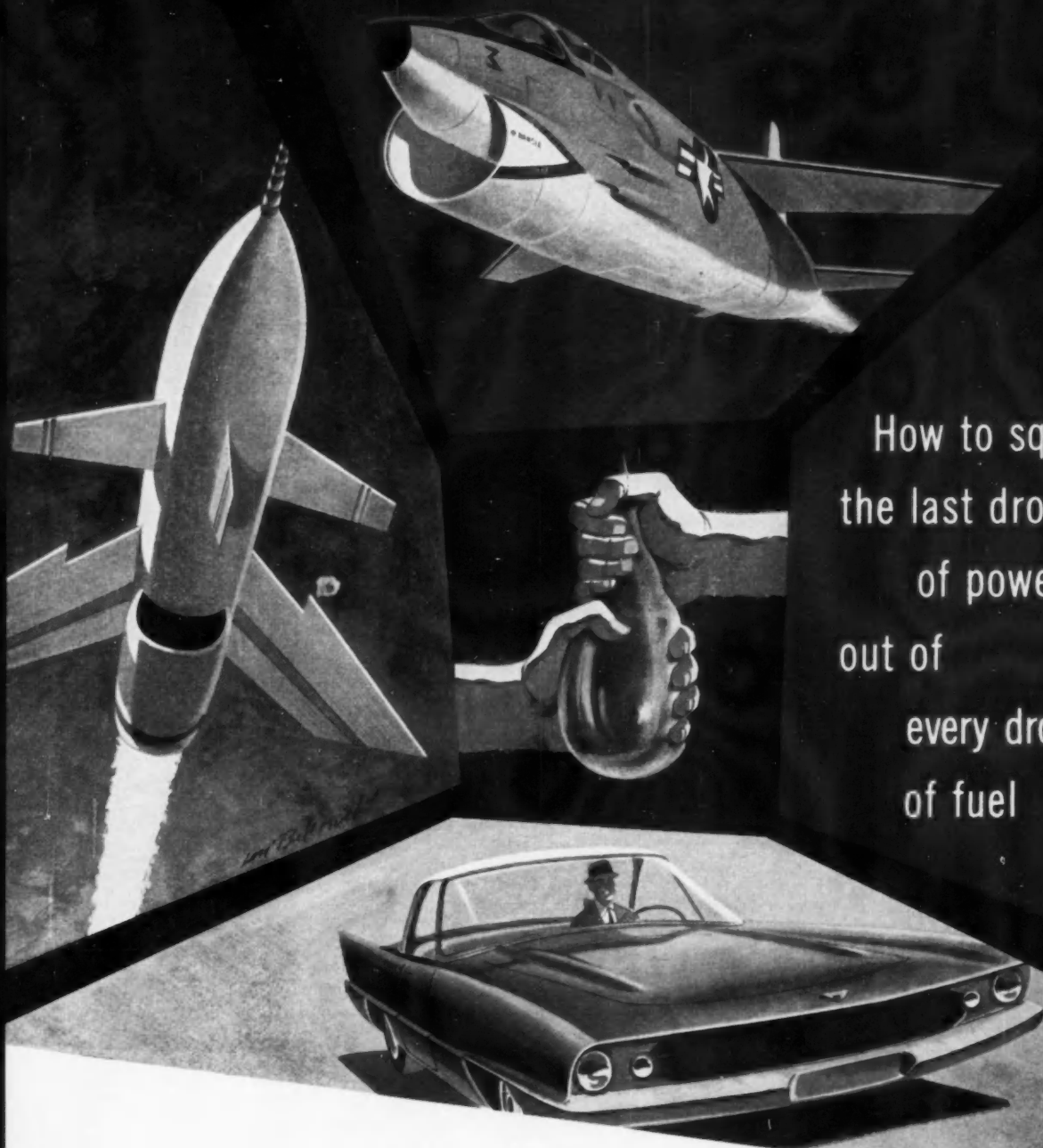
Another strong German capability has to do with government assistance and subsidies as well as terms and conditions of sale. Because the German machine tool industry exports almost half of its output, the German government has always been more realistic and sympathetic in giving aid to one of its basic industries. This can take the form of tax rebates on exports, of subsidized foreign fairs and exhibitions, or trade barter deals, and of government subsidized or guaranteed credit facilities which permit German machine tool manufacturers to accept orders abroad on extremely favorable conditions.

Probably one of the reverse capabilities of the German machine tool industry would be the financial condition of the average company. In view of the fact that most of them were forced to rebuild after the war, and in view of the fact that most of them were family owned companies desiring to retain the element of control, considerable debt financing occurred—not only via the route of bank borrowings but also the route of extremely high advance payments from customers. In addition, most of the German companies show a contingent liability as a footnote on their balance sheet covering the so-called "Present Temporary Capital Levy According to Peacetime Equalization Law," which is a tax payable over some 30 years in quarterly installments to take care of war damage destruction, essentially of residences and the like. In the case of Schiess, Dusseldorf, this amounts to almost 40 per cent of its capitalization. In addition, today, bank credit for the average small company is exceedingly tight in Germany, and interest rates in the area of 10 per cent are not uncommon. It is quite evident, therefore, that the average German machine tool company does not have much "fat" on its ribs and would probably have much difficulty in weathering any type of economic crisis.

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the last drop  
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### Americans in motion depend upon Holley

The startling advances in the last decade in pounds of thrust, in horsepower have exceeded nearly every other decade in America's engine development history. The challenge of contributing to this advance has fallen to Holley engineering teams with such varied problems as lighter weight, more compact fuel controls for jet engines, carburetors with more and more breathing capacity, ignition systems with more and more accuracy.

Holley's two teams of design and manufacturing engineers have developed prod-

ucts as unlike the carburetors of the past as jet engines to Stanley steamers.

Today, Americans stand on the threshold of a decade which will far outmode the power outputs of today. Holley engineers are currently working on control systems for power outputs relegated just yesterday to science fiction.

As in the last fifty years, Americans in motion will depend upon Holley products.

For more information about Holley products, automotive and aircraft, write to HOLLEY CARBURETOR CO., 11955 E. Nine Mile Road, Warren, Michigan.

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## POWDER METALLURGY SHOW and MEETING

(Continued from page 60)

being produced by powder metallurgy techniques at appreciable cost savings.

H. H. Hausner, consulting engineer, described a new powder metallurgy technique, developed to permit fabrication of complicated shapes and parts with large dimensions, in a paper entitled "Slip Casting of Metal Powders — A

Commercial Reality." The method is similar to the well-known process of slip casting in ceramics. Various methods for hot forming metal powders, including pressing, extrusion, rolling, swaging, drawing, and hydrostatic pressing, were covered in a paper by H. H. Hirsch of General Electric Co. G. C. Madigan, Bendix Products Div., Bendix

Aviation Corp., discussed the use of metal powders for barrel finishing in a paper by that title.

Advancements in powder metallurgy production techniques were featured in other papers presented at the meeting. Various gas atmospheres for sintering of metal powders were covered in two important sessions. E. P. Kawasaki of Republic Steel Corp. led off this subject with a paper entitled "Effect of Sintering Atmospheres on the Properties of Sintered Iron Compacts." His presentation was followed by a general panel discussion of all types of sintering atmospheres, as applied to both ferrous and non-ferrous parts.

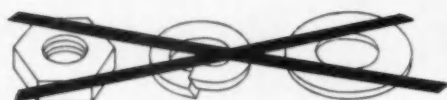
The production of nuts and washers from brass powders was described by P. V. Tarr of Midwest Sintered Products Corp., while a paper on "Chromizing of Iron Powder Parts" was presented by R. P. Seelig of Chromalloy Corp. F. N. Rhines, Carnegie Institute of Technology, gave a lecture on "A New Viewpoint on Sintering."

An international flavor was lent to the program by two papers involving powder metallurgy developments in Russia and Japan. C. G. Goetzel, speaking on "What is Russia Doing with Powder Metallurgy?", reviewed processing and testing techniques in current use in the U.S.S.R. and progress being made in the study of the powder metallurgy of beryllium, titanium, tungsten, and other metals. The powder metallurgy industry in Japan has grown rapidly with the development of manufacturing facilities and a continuous supply of ferrous powder. Immediate problems are how to lower process costs, simplify facilities, and improve quality and productivity.

### EXHIBITS

One of the most important technical developments featured in many of the show exhibits involves the "infiltration" of powder metallurgy parts. Such parts are made by first forming a porous iron or steel structure, and then infiltrating the pores with molten copper or brass, to form a 100 per cent dense metal structure with high strength, elongation, and wear characteristics. Many different types of gears, for example, are

## Replace **THREE** fasteners



with **ONE**  
**WASHER**

**TYPE**

**PALNUT**  
**LOCK NUT**



Type D (above). Available in a variety of base diameters.



Type D, with Sealer. Bonded-in plastisol compound seals out dirt and water.



Grounding Type. Teeth in base cut through non-conductive coatings to form electrical ground. Available with sealer.



Spacer Type spans die-cast bosses. Available with sealer.



Type E has flat top for use on electrical terminals.

- **Big Savings.** Washer Type PALNUTS replace ordinary nuts, lock washers and flat washers—cost much less—reduce parts and handling—cut assembly costs.
- **Fast Assembly.** The PALNUT is picked up, started and tightened in one high-speed operation, using PALNUT magnetized socket wrenches. Spins on freely, seats with high torque.
- **Tight Assemblies.** Spring locking action grips the screw thread, while spring washer base assures resilient contact against assembled parts.
- **Resilient Locking Action** absorbs shock of tightening, permits safe assembly of fragile or pliant parts.
- **Washer base spans holes and slots.**
- **May be removed and re-used.**
- **Wide selection of sizes.**

Write for Free Samples, stating type and size  
THE PALNUT COMPANY, 60 Glen Road, Mountainside, N. J.  
Detroit Office and warehouse:  
730 West Eight Mile Road, Detroit 20, Mich.

**PALNUT®**

**LOCK NUTS**  
**FASTENERS**



Quick, secure fastening at low cost



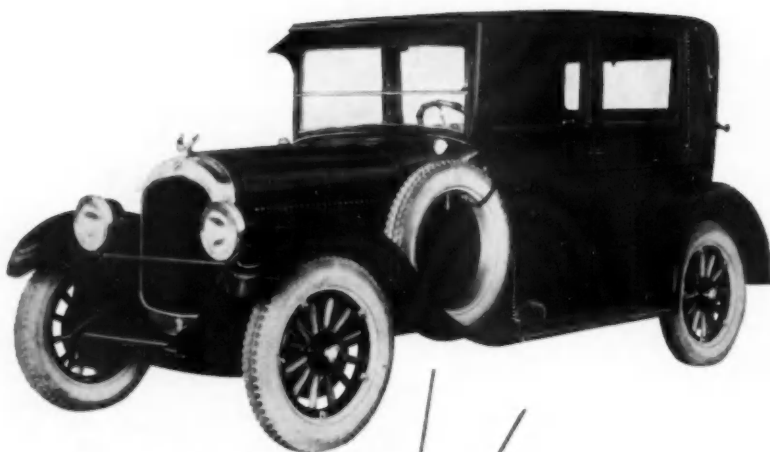
ARTIST'S INTERPRETATION

**There is no substitute for stainless steel  
in outer space**

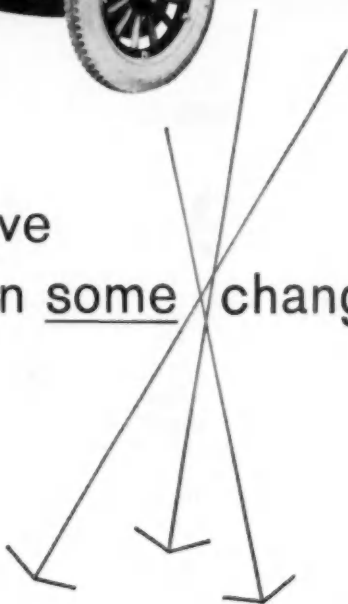
From the intense cold of outer space to the heat of a jet engine, Stainless Steel is the one metal that will stand up. In rockets, missiles and supersonic aircraft, Stainless Steel resists heat, friction and corrosion, has a high strength to weight ratio and maintains its structural integrity under the most severe conditions.

Specify McLouth high quality sheet and strip Stainless Steel. McLouth Steel Corporation, Detroit 17, Michigan.

**Mc LOUTH STAINLESS STEEL**



There have  
been some changes made



Many things have changed in the years since the first Chrysler automobile, the 1924 six cylinder Brougham, was produced. Thirty-four years of constant progress in design and engineering are reflected in the 1958 model.

Purolator is proud of its association with Chrysler, which began with the first production model and has continued, through the years, right up to the 1958 line. The progress of the automotive industry has been matched by that of Purolator in engineering skills and manufacturing facilities. Purolator designed and made the first automotive oil filter . . . it was a big feature of the 1924 Chrysler . . . and has continuously designed and made the exact filters required for the specific needs of the industry. They are ready to meet future filtration requirements.



*Filtration For Every Known Fluid*

**PUROLATOR**

**PRODUCTS, INC.**

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

now being produced by this method.

Furnaces and atmospheres for sintering powder metal products formed the focal point of attention in the Lindberg Engineering Co. booth, while Harper Electric Furnace Corp. featured its line of heat treating furnaces. Federal-Mogul Bearings, Inc., was on hand with a display of copper-alloy lined sleeve bearings, formed bushings, and thrust washers. It also had set up a working demonstration of pre-alloyed metal powder atomization.

Design features of its powder metal presses were shown by F. J. Stokes Co., while Hamilton Div. of Baldwin-Lima-Hamilton Corp. took advantage of the occasion to introduce two new compacting presses. These are (1) a 1000-ton unit, Model 1000-H, said to be the largest completely automatic press of its type ever built, and (2) a 75-ton unit, Model 75-A, an advanced design, high production, high-accuracy machine. The 1000-H, capable of production speeds up to 10 pieces per minute, was designed for compacting powdered metals, nuclear fuels and solid fuels for rockets and missiles, ceramics, carbides, and abrasives. The new 75-A press, a complete redesign of the previous Hamilton-built Model 20-A, is made for compacting powdered metals, abrasives, cermets, and ferrites.

Prealloyed steel powders, having the same composition and characteristics as cast or wrought alloy steels, are being successfully used to make intricate parts requiring corrosion resistance and high strength. Examples of such parts were displayed at the Show by Vanadium-Alloys Steel Co. New Jersey Zinc Co. also displayed an interesting variety of structural, mechanical, and infiltrated parts for diverse applications.

Such technical advances in powder metallurgy as larger presses, bigger and more complex parts, better powders, etc., were apparent in the applications, materials, and equipment on display at the remainder of the 25 booths comprising the Show. Other exhibitors included Alan Wood Steel Co., Easton Metal Powder, Inc., Republic Steel Corp., and Whitaker Metals Corp.

AUTOMOTIVE INDUSTRIES, May 15, 1958

**BEFORE...**

Separate Bolts, Nuts and Washers complicate inventories, increase assembly costs.



**AFTER...**

Washers as integral parts of bolts and nuts eliminate problems, speed assembly at lower cost.



# Save Money

*by simplifying fastener design*

Here is a simple application of a basic bolt making principle which is affecting substantial savings for a number of manufacturers.

These savings, resulting from simplified design, are realized in every step of the operation from lower first cost of the fasteners through inventory to final assembly. Totalled, they are well worth while.

There are many other basic principles... often overlooked in designing and specifying fasteners, which are of importance cost-wise.



You'll find them in our new booklet, "How to specify fasteners... and save". Filled with drawings and charts, it makes a handy guide in designing or buying any headed parts.

If you can use a copy, write to North Tonawanda or ask a Field Representative.



## BUFFALO BOLT COMPANY

*Division of Buffalo-Eclipse Corporation*

North Tonawanda, N. Y. • Princeton, Illinois

MAKING BOTH FASTENERS AND FRIENDS FOR 100 YEARS

• 3 convenient service centers

**WESTERN OFFICE**  
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REctor 2-1888

**CENTRAL OFFICE**  
North Tonawanda  
JACKson 2400 (Buffalo)

## Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

(Continued from page 100)

now Public Law 85-381, are:

1—New Federal funds are made available for highway programs—\$800 millions for the Interstate System, \$2.225 billions for primary and secondary systems, and \$235 millions for public domain roads, or \$3.260 billions of Federal funds. Matching state funds under vari-

ous ratios will total \$2.113 billions, for a grand total of \$5.375 billions.

2—To provide for an immediate speed-up, supplemental authorizations of \$200,000,000 for the year ending June 30, 1959, and \$300,000,000 each for the two following years are made for the Interstate System.

3—Also for the year ending June 30, 1959, a \$400,000,000 supplement is provided for primary and secondary systems, to be made available to the states immediately on a  $\frac{2}{3}$  Federal,  $\frac{1}{3}$  state funds ratio, instead of the 50:50 ratio heretofore. Furthermore, the states are permitted to borrow from an additional sum of \$115,000,000 for up to  $\frac{2}{3}$  of their matching funds.

4—For 1960 and 1961 fiscal years, additional funds for primary and secondary systems are made available on the traditional 50:50 ratio, the totals authorized under this act being \$900,000,000 for 1960 and \$925,000,000 for 1961.

5—Finally, the bill approves the increased estimate of Interstate System costs as the basis for fiscal 1960 apportionments.

The net result of the act will be to increase the Interstate System funds for fiscal 1959 from the present \$2.0 billions to \$2.2 billions; provide an additional \$400,000,000 for primary, secondary, and urban roads for fiscal 1959, and an additional \$11,000,000 for public domain roads for the same fiscal year. The state so-called emergency funds are available only for projects under contract by Dec. 1 of this year, and scheduled for completion before Dec. 1, 1959. Later appropriations are increased also.

### New Truck Crane

Harnischfeger Corp. has announced a new 70-ton truck crane, gasoline or Diesel powered, and mounted on an 8-wheel, 4-wheel drive carrier, which it claims can accurately spot 70 tons at a 15-ft radius. The new unit, designated the 775-TC, it is capable of a 200-ft lift. Both carrier and upper frames are of welded construction. The carrier is 33 ft long, 11 ft  $\frac{3}{4}$  in wide, and 13 ft  $4\frac{1}{2}$  in high to the top of the cab. With a standard boom, the unit weighs 133,800 lb. Removable front and rear outriggers and counterweights provide for maximum weight reduction for fast job-to-job moving.

### Declining Shipments

U. S. Department of Commerce figures for 4th quarter 1957 show the decline in shipments of exca-

# ROCKFORD



## MORLIFE® CLUTCHES

**Keep Heavy-Duty Machines  
400% More Hours ON the Job  
90% Less Time IN the Shop**

MORLIFE clutches serve from four to ten times longer than previous types of friction clutches using organic facing materials. Adjustments and plate replacements have been reduced to one-tenth those required by previous clutches. The longer on-the-job hours and increased pay loads which MORLIFE clutches make possible furnish a competitive advantage for machines in which these NEW clutches are used. Increased clutch life results in decreased operation cost of vehicles or equipment.



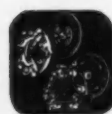
**SEND FOR THIS HANDY BULLETIN**

Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

**ROCKFORD Clutch Division BORG-WARNER**

315 Catherine St., Rockford, Ill., U.S.A.  
Export Sales Borg-Warner International — 38 So. Wabash, Chicago 3, Ill.

# CLUTCHES



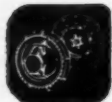
Small  
Spring Loaded



Heavy Duty  
Spring Loaded



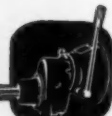
Oil or Dry  
Multiple Disc



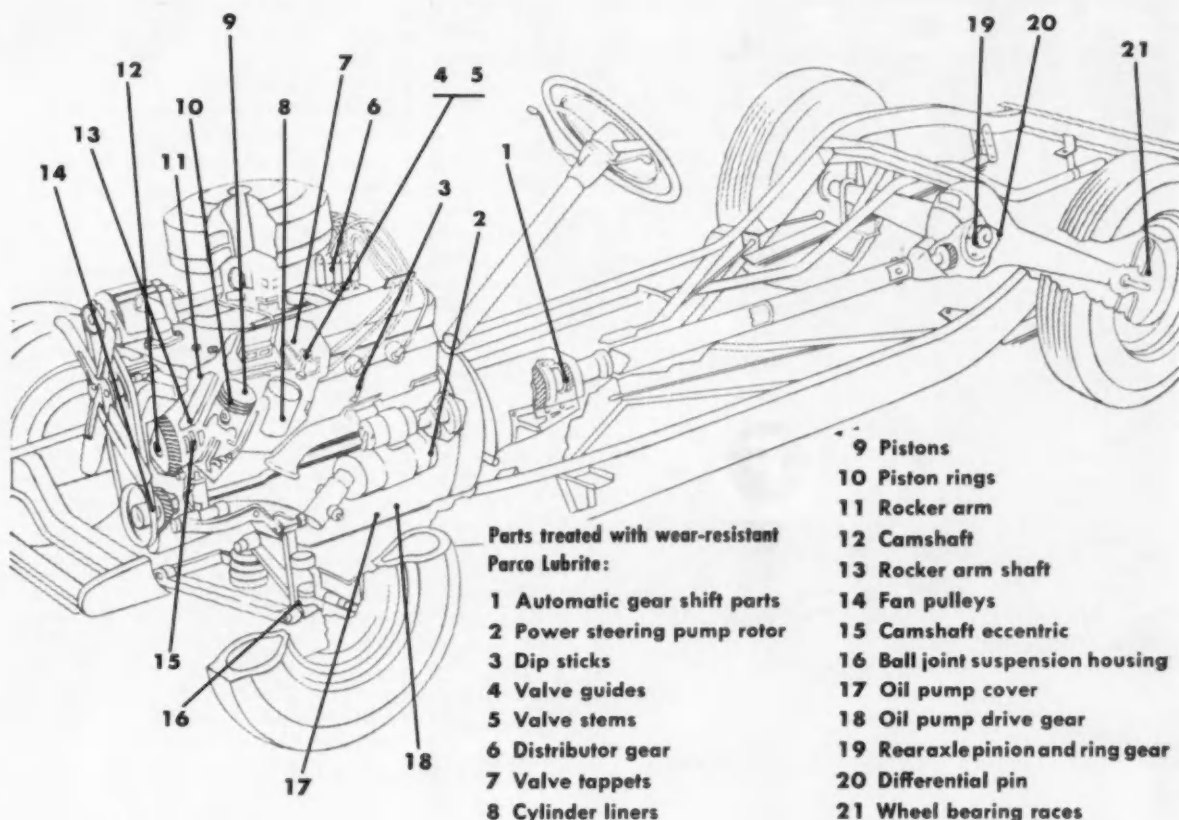
Heavy Duty  
Over Center



Power  
Take-Offs



Speed  
Reducers



Parts treated with wear-resistant Parco Lubrite:

- 1 Automatic gear shift parts
- 2 Power steering pump rotor
- 3 Dip sticks
- 4 Valve guides
- 5 Valve stems
- 6 Distributor gear
- 7 Valve tappets
- 8 Cylinder liners

- 9 Pistons
- 10 Piston rings
- 11 Rocker arm
- 12 Camshaft
- 13 Rocker arm shaft
- 14 Fan pulleys
- 15 Camshaft eccentric
- 16 Ball joint suspension housing
- 17 Oil pump cover
- 18 Oil pump drive gear
- 19 Rear axle pinion and ring gear
- 20 Differential pin
- 21 Wheel bearing races

## The automotive industry shows how to save money by using Parco Lubrite

Wearing surfaces—the vital parts that move or roll or slide against each other—can cost the manufacturer far more than their original price.

If one of them fails prematurely in use, because of improper break-in, there's the cost of replacement, the field service charge, and the customer's ill-will to be reckoned with.

To promote smooth, safe initial operation, to prevent galling, scoring and welding, and to lengthen subsequent life, friction parts should be treated with Parco Lubrite.

This nonmetallic, oil-holding coating eliminates metal-to-metal contact during wearing-

in, keeps a film of lubricant between bearing surfaces, provides priceless protection for fractions of pennies.

Automobile manufacturers have cut field service costs by the use of Parco Lubrite. How about *your* product? Let the Parker technical representative investigate for savings!

### DETAILED TECHNICAL INFORMATION

Technical bulletin, with photomicrographs and data, on Parco Lubrite wear-resistant coatings.

Send for it. It's free.



# PARKER RUST PROOF COMPANY

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**BONDERITE**  
corrosion resistant  
paint base

**BONDERITE and BONDERLUBE**  
aids in cold forming  
of metals

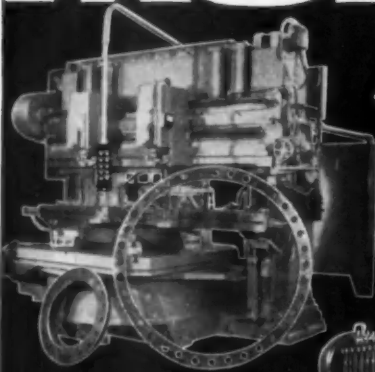
**PARCO COMPOUND**  
rust resistant

**PARCO LUBRITE**  
wear resistant for friction  
surfaces

**TROPICAL**  
heavy duty maintenance  
paints since 1953

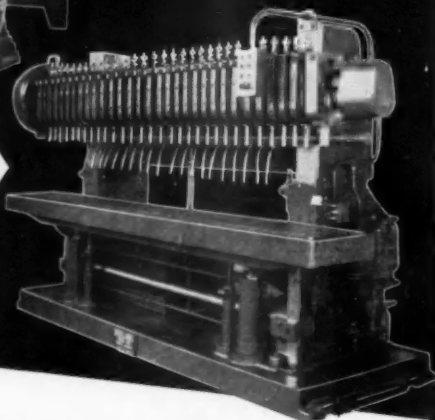
\*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

# MOLINE



HD68 drills bolt circles from 12" to 100" diameter. Each of the two spindles has capacity for 2 1/2" drill in steel. Operating cycle is fully automatic.

HD13 straight line-type drilling machine with capacity for thirty 3/4" drills in steel. Used for work on heavy castings, round and rectangular steel tubes, structural shapes, plates and grader blade drilling or countersinking.



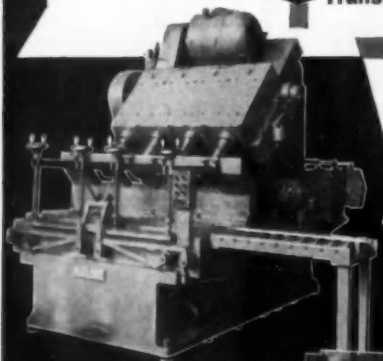
*For Greater*

**PRODUCTION... EFFICIENCY... SAVINGS**

Use an individually designed "Hole-Hog" Machine Tool for such jobs as...

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Transfer-Type and Special Machines

**OVER 57 YEARS OF  
MACHINE TOOL ENGINEERING  
EXPERIENCE IS AT YOUR SERVICE.  
TELL US YOUR PARTICULAR  
PROBLEM**



13CB hydraulic feed cylinder boring machine. V-8 engine blocks are rough and finish bored for wet-type cylinder sleeves. Units of this kind are applicable for transfer machines.

MR152 performs drilling, reaming, spot facing and chamfering operations on tractor rear axle housings. A companion machine, MR151, does tapping in addition to the foregoing operations. Work holding fixtures are mounted on power driven trunnion.



**MOLINE TOOL COMPANY**

REPRESENTATIVES IN PRINCIPAL CITIES

100 20TH STREET • MOLINE, ILLINOIS

109

vating and earthmoving machinery. A total of \$28 millions in equipment shipped represented a 42 per cent decline from the preceding quarter. Shipments of contractors' wheel tractors were \$10.6 millions, compared with \$27.5 millions in the preceding quarter.

## New Contracts

The month of March saw awarding of construction contracts for 188 miles of Interstate System highways, at an estimated cost of nearly \$90 millions, the Bureau of Public Roads reported. Preliminary engineering to the amount of \$10 millions and right-of-way acquisition at an estimated \$37 millions were authorized also. Completed in March was 10 miles of construction, including 33 bridges, at a cost of \$7 millions.

In the 21 months since the passage of the Highway Act, and up to April 1, 3801 miles of construction have been advertised, put under way, or completed, at an estimated cost of \$1.98 billions. Preliminary engineering and right-of-way acquisition authorized totaled \$1.37 billions. As of the same date, April 1, construction was under way upon 2400 miles of the Interstate System roads, at an estimated cost of \$1.35 billions. Construction completed in those 21 months was 1404 miles, at a cost of \$328 millions.

## Higher Inventories

Rising inventories of finished machinery, and the cost of carrying these inventories, were plaguing most of the construction equipment manufacturers. Caterpillar Tractor Co. announced the layoff of 2100 additional employees for April 25. Many other companies had already made adjustments and readjustments in production to bring it into line with sagging sales.

## AUTOMOTIVE INDUSTRIES . . .

*is your News Magazine of  
Automotive and Aviation  
MANUFACTURING*



# OILITE

SELF-LUBRICATING

# BEARINGS

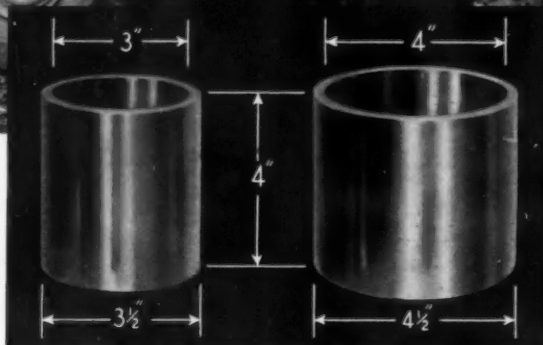
**prove a match for top payloads  
on ATHEY Rear Dump Trailers**

Oilite\* Bronze Bearings have proven more than a match for the 22 and 34-ton payloads on Athey Rear Dump Trailers.

Oil-cushioned against shocks and impacts, these Oilite heavy-duty bearings have demonstrated that they will withstand years of punishment and still give satisfactory service. They require only infrequent lubrication and help Athey substantially increase the dependability of its hauling units. Yet, Oilite Bearings *cost less* than many other type bearings!

No wonder more and more designers are specifying popular Oilite self-lubricating Bearings for motor vehicles, appliances, engines, power tools, machinery and countless other products.

Contact your local Oilite Engineer today. He'll gladly provide complete design information to help you make your bearing and bushing applications low-cost, dependable and maintenance-free. Look for him in your telephone directory under "Bearings—OILITE" or write direct to Dept. K-5.



#### TYPICAL PROPERTIES OF SELF-LUBRICATING BRONZE OILITE BEARINGS †

Porosity, % . . . . .	18-23
Ultimate Tensile Strength, (psi) . . . . .	18,000
Compressive Strength (psi) . . . . .	20,000
Elongation, % min. in 1" . . . . .	10
Brinell Hardness . . . . .	40

† Other materials and physical  
properties available.

\* REGISTERED TRADEMARK  
ONLY CHRYSLER MAKES OILITE

*the most trusted name in powder metallurgy*



## AMPLEX DIVISION

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN  
SELF-LUBRICATING BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

## BUICK ENGINE PLANT

(Continued from page 69)

lands in an automatic cycle with self loading and unloading. The feeding of work to each row is organized by an installation of Lamb automatic conveyors. Pistons ready for this operation are moved by elevator for feeding onto an elevated horizontal distribution conveyor spanning the group of machines. From here the pistons are scheduled to each of the ma-

chines, on demand, along a chute leading to the feeding device.

When the machining cycle has been completed, the piston is ejected and rolls down a chute leading onto a belt conveyor. At the junction of the chute and belt, the pistons are flipped into proper position for feeding to the next operation.

The belt conveyor transports pis-

tons first to a group of Ex-Cell-O precision-boring machines for boring the piston pin hole. Then they are placed on another conveyor to a Blakeslee washer, and out of the washer via two separate chutes for feeding to Morris weight mills. The Morris machines too are fully automatic, weighing the piston to determine the amount of metal to be removed, then removing this excess by milling at the next station.

It may be of general interest to find that chassis frames scheduled for air ride cars are shunted to a special power-driven assembly conveyor in a department located near the final assembly line. Here the frames are loaded upside down in a transverse position to facilitate the installation of the reservoir, the air cushions, the system of valving and plumbing lines. Near the end of the line a special fixture made of magnesium—for easy handling—is attached over the rear end suspension to provide a standard height platform for the zero adjustment of the rear leveling valves.

Finally, the four air cushions are fitted with hold-down clamps and the entire system placed under an air pressure of around 130 psi. While holding this pressure with the shop air supply, the operators proceed to spray a soap-water solution on the many joints and fittings as well as the air cushions to seek evidence of leaks. Needless to say, air leaks cannot be tolerated. If an occasional leak is discovered, the job is thoroughly checked and the leak repaired.

Upon completion of this sub-assembly, the frames are transported to the start of the final assembly line according to schedule.

• • •


### Ford Fund Awards 70 College Scholarships

The Ford Motor Company Fund has awarded four-year college scholarships to 70 high school seniors in 11 states. The scholarship winners are sons and daughters of Ford Motor Company employees.

The grants include payment of all tuition and academic fees, plus 80 per cent of normal living costs up to \$750 a year for students away from home and \$300 a year for students living at home.

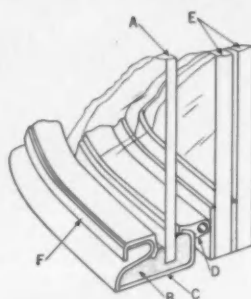
## Dual VISION-AID HEADLAMPS



 **TUNG-SOL ELECTRIC INC.**  
NEWARK 4, NEW JERSEY

Sales Offices: Atlanta, Ga.; Columbus, Ohio; Culver City, Calif.; Dallas, Tex.; Denver, Colo.; Detroit, Mich.; Melrose Park, Ill.; Irvington, N. J.; Newark, N. J.; Philadelphia, Pa.; Seattle, Wash. Canada: Montreal, P. Q.

Cutaway section of Douglas Aircraft acoustic window used on the DC-7 below. The noise barrier is an acrylic pane (A) mounted in a foam rubber damper (B). Damper is retained in a metal pan (C). A flexible HYPALON seal (D) is compressed between the inner pane and the double thickness outer window (E). A neoprene seal (F) is cemented to the metal retainer.



## Douglas Aircraft seals new acoustic window with Du Pont neoprene and HYPALON®

Douglas Aircraft has developed an improved acoustic window, designed for pressurized aircraft cabins. It is now in use on the DC-7, and a similar design will be used on the new jet DC-8. To meet the rigid demands of flight conditions, two Du Pont elastomers — neoprene and HYPALON — were selected to seal the window.

The flexible seal between the noise barrier and double pane (see D in diagram) required a resilient material with complete resistance to ozone, high color stability and low temperature flexibility without the use of a plasticizer. (Plasticizers become volatile at low

pressures found at high altitudes and condense on the window panes.)

Douglas engineers chose HYPALON because it was the only elastomer to meet these specifications. HYPALON has complete resistance to ozone. Unlike most rubbers, it can be compounded in a wide range of stable colors without sacrificing its other properties. This versatile synthetic rubber resists hardening at extreme temperatures (250° F.-350° F.) and retains its flexibility at temperatures as low as -40° F. without the use of a plasticizer.

Neoprene was chosen for the inner seal (F in diagram) because of its high

resistance to ozone cracking. It retains its resilient properties in the face of heat, flexing, weather and sunlight. Neoprene is resistant to oil, chemicals, abrasion and cutting... and will not support combustion.

Investigate the design possibilities of Du Pont neoprene and HYPALON. Neoprene is currently used in aircraft fuel line connectors, heating system hose and cable jacketing. HYPALON is used in molded and extruded parts, fabric coating and convertible tops. For more information on the uses and properties of neoprene and HYPALON, just clip the coupon below.

HYPALON is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)

### ELASTOMERS IN ACTION

### HYPALON® • NEOPRENE



Better Things for Better Living  
... through Chemistry

- ☐ I am particularly interested in \_\_\_\_\_
- ☐ Send me a free copy of *The Du Pont Elastomers* (a review of properties of neoprene and HYPALON).
- ☐ Add my name to the free mailing list of the *Elastomers Notebook* (contains articles based on uses of Du Pont elastomers in industry).

E. I. du Pont de Nemours & Co. (Inc.)  
Elastomer Chemicals Dept. AI-5  
Wilmington 98, Delaware

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*Precision?*  
*Dependability?*  
**it's AUTOMATIC!**



**STRESS RELIEVING**  
 at Automatic puts "ZING" in your springs

No matter how accurately a coiled spring meets specifications, it will not stand up in actual use unless the internal stress of the metal (caused by coiling) is properly relieved by a prolonged low temperature heat-treating process.

Automatic's stress relieving know-how determines the best possible length and degree of "cooking heat," thus guaranteeing the user the optimum in lasting resiliency and load-carrying capacity.

Send for new illustrated brochure giving information for the specifying of springs and other data.



for quality springs "Automatically" think of

**AUTOMATIC**

**SPRING COILING CO.**

4048 West Thorndale Ave., Chicago 30, Ill.

## AIRBRIEFS

(Continued from page 96)

atomic radiation testing.

The portable reactor made 47 experimental flights from Fort Worth aboard a modified but conventionally-powered B-36 bomber, the NB-36H. It was the world's first airborne reactor. It was used for airborne tests of shielding procedures and did not power the aircraft.

### Beech Receives \$3 Million Order

The United States Army has awarded Beech Aircraft Corp. a \$3 million production contract for an additional quantity of U. S. Army L-23D "Seminole" aircraft.

As a result of the new order, L-23D production will extend through March, 1959. Concurrent with the manufacture of new planes, Beech is also rebuilding early "A" and "B" models in L-23D configurations under a separate \$1.7 million modernization program.

Military version of the commercial Beechcraft Twin-Bonanza business plane, the Seminole, is a twin-engine aircraft employed at corps and higher headquarters level for command, liaison and courier missions. Primary uses include personnel transportation, aerial mapping, medical evacuation and general utility.

### Safety in Flight

Today it is more than four times as safe to travel by domestic scheduled airline than by automobile. During 1956, the latest figure available for the automobile industry, there were 26,100 automobile and taxi passenger fatalities, representing a rate of 2.7 fatalities per 100 million passenger miles. During the same period the airlines accounted for 143 passenger fatalities, for a rate of .64 fatalities per 100 million passenger miles.

In 1957, the combined U. S. scheduled domestic and international airlines achieved a safety record practically unparalleled in

# easy to form



You can form these castles in a variety of sizes and shapes. And Parish Pressed Steel Division of Dana Corporation, a leading manufacturer of automotive chassis and frames, uses A. W. Dynalloy steel for the same reason . . . easy formability!

There are other reasons, of course. A. W. Dynalloy is

- . . . resistant to shock
- . . . easy to weld
- . . . resistant to corrosion

As with Parish Pressed Steel, A. W. Dynalloy can give you more value per dollar spent on your steel product. Send for our A. W. Dynalloy booklet which gives complete information. Write Marketing Division, Dept. DY-E90.



## A. W. DYNALLOY

### ALAN WOOD STEEL COMPANY

*steelmasters for more than a century and a quarter* CONSHOHOCKEN, PA.

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## LONGER DIE LIFE, AUTOMATIC OPERATION THE Clearing Hi-Speed Press

A Clearing Hi-Speed Press is the combination of ruggedness and speed that you've been looking for to run progressive and high speed blanking dies. The frame is beefed up with plenty of extra steel where it counts. Square gibbing with oil lubricated bronze ways hold the slide in lasting alignment. As a result, you can trust your most expensive dies to these machines, and get more out of them. Bed and slide are twice as rigid as a standard press—die life increases far beyond normal expectations.

These presses are ready to go when they reach your plant—all controls and automatic equipment are in place. Installation is simply a matter of connecting the air line and electricity.

A complete line of Clearing Hi-Speed Presses is available from 50 through 200 tons. Speeds to 300 SPM. Write for bulletin.



# CLEARING PRESSES



the way to efficient mass production

**CLEARING MACHINE CORPORATION** division of **U.S. INDUSTRIES, INC.**  
6499 W. 65th Street—Chicago 38, Illinois / Hamilton Division, Hamilton, Ohio

airline history.

The rate was two-tenths of a passenger fatality per 100 million passenger miles as compared with five-tenths of a fatality per 100 million passenger miles in 1956. This record was achieved during a year when scheduled air carriers flew an all-time high of more than 31 billion revenue passenger miles.

## Scientists from West, East, to Exchange Air Space Ideas

The world's foremost air and space scientists will gather in Madrid, Spain, September 8-13, for the First International Congress of the Aeronautical Sciences—literally an international trade fair in aero and astronautic ideas.

This exchange of thought has been planned by the International Council of the Aeronautical Sciences (ICAS) in the form of several technical sessions at the Palace Hotel.

## TURBINE WHEELS

(Continued from page 51)

bine designs employing pressure ratios of 6 to 1 and higher. With increased pressure ratio and higher unit loadings Ford now is experimenting with gas turbines which have wheels only about 6-in. in diameter.

Despite the fact that this development stemmed from a special problem at Ford, the resulting technique can be applied to wheels of any diameter; and the forging practice permits the use of any kind of material including molybdenum, columbium, and titanium alloys, as well as any of the more exotic alloys. One of the secrets of the extrusion process is the employment of forging temperatures far beyond what is considered to be acceptable practice. It is claimed that even the early attempts proved that the metals, when subjected to high extrusion temperatures, not only retained their original physical properties but in some instances actually showed improvement.



Steelmaking furnaces in the U. S. produced 112,714,996 net tons of ingots and steel for castings in 1957—a total exceeded in only two other years. Output in 1955, the record year, was 117 million tons.

World steel production in 1957 was a record 322 million net tons, an 11-million-ton increase over the record output of 311 million net tons in 1956.

The number of steel industry stockholders in 1956 was over 800,000—more than the population of San Francisco in the 1950 census.

It cost three to four times as much to increase the octane number of gasoline by one point at the 96 octane level as it does at the 84 octane level.

America's offshore oil "fleet" will grow by an estimated 220 crew boats, 50 supply boats, and more than 300 cargo barges in the next 14 years.

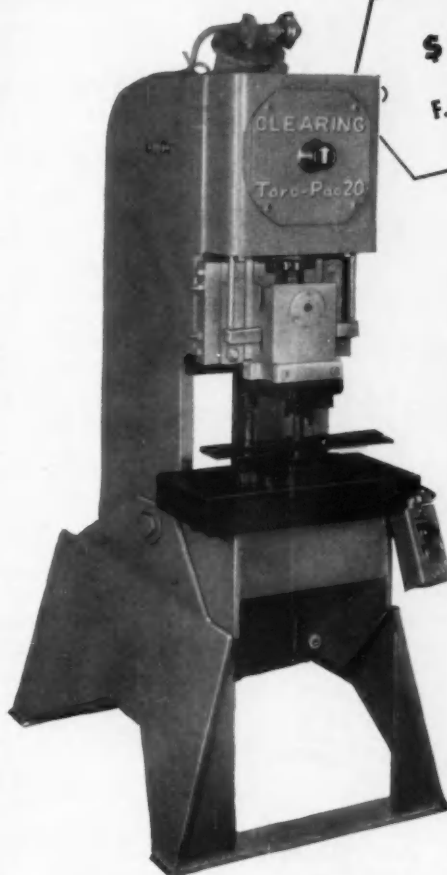
The petroleum industry pays more taxes—almost \$6 billion annually—than any other single industry in the U. S.

With the help of petroleum power, one large utility company in New York City turns out almost half as much usable energy as did all the men, animals, and minerals used in the U. S. in 1860.

More than 1.5 million square miles of the U. S. are considered possible prospective oil and gas lands—only 20 per cent of this area has been amply explored and developed.

Canada produced about 360 million pounds of nickel in 1957, or about 75 per cent of the world's entire supply.

AUTOMOTIVE INDUSTRIES, May 15, 1958



**\$1,395<sup>00</sup>**  
F.O.B. HAMILTON, OHIO

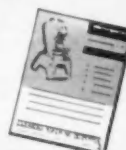
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all time  
**HIGH**  
in a  
press  
**BUY**

This is the Clearing Torc-Pac 20—an all steel welded O.B.I. with deluxe features normally found in only the more expensive presses. Featuring an enclosed design, this geared press offers a choice of variable speed ranges and a top speed of 225 S.P.M.

#### AIR FRICTION CLUTCH AND BRAKE

The Torc-Pac 20 has an air-friction clutch and brake—a transmission unique in design and revolutionary in performance. The clutch and brake combination works in oil. It's designed so that normal wear which takes place in a conventional air friction clutch, just doesn't happen in the Torc-Pac. Sound impossible? Why not find out.

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## Goshen Rubber Co., Inc.

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GOSHEN, INDIANA

## Automation Conference

(Continued from page 72)

ment to the success of a research organization to be able to cross boundaries in a concerted attack upon a scientific or technical problem. The success of wartime work with technical problems in radar and atomic energy was largely due to this crossing.

### Cost Studies in the Navy

Adm. Rawson Bennett, chief of the office of Naval Research, told of the development by the Navy of cost studies by value engineers—men who were given the job of studying all products and operations to see if less expensive materials or processes could be used. A danger in automation, he said, was that the rigidity of the machine setup might freeze companies into improvements in the old product, and cause them to miss the spin-off of often unexpected uses.

### Automation Specials

Gerhard Nothmann, manager of the mechanical engineering research department at Armour Research Foundation, pointed out that automation is a composite of technologies. Two, three, or more scientific groups may cooperate—the mechanical engineers to work out the process, fluid mechanics specialists to handle the pneumatic or hydraulic systems, heat transfer specialists for designing the oven, if one, and electrical or electronics engineers to create the electrical controls and integrate operations.

## Inclined Engines at Indianapolis

(Continued from page 58)

mounts a highly modified De Soto V-8 engine in a Kurtis 500-A chassis. The owners worked on the engine for three years. The only claimed stock parts are: block, head, rocker arms, rocker arm stands, oil pan, and valve covers. All other engine parts are custom made.

Engine specifications: bore, 3.670; stroke, 3.000; displacement, 255 cu in.; compression ratio, 14:1. Tony Capanna reports early tests showed 318 hp at 5500 rpm.

The engine has Harman-Collins roller cams, Hilborn fuel injector, and Joe Hunt Vertex magneto. Total engine weight is 510 to 525 lb, somewhat heavier than the Offenhauser. Mounting of the engine is upright, 6 in. off center to the left. Cylinder heads exposed outside the frame rail help cooling.

• • •

### General Motors Gives \$35,000 To United Negro College Fund

General Motors has granted \$35,000 to the United Negro College Fund, bringing to \$170,000 the amount GM has given to the Fund. The drive for funds aids 33 Negro colleges in 12 states.

Dr. DeWitt T. Burton, in accepting the gift, said GM's contribution was one of the "largest individual grants received from any corporation."

# IMPERIAL **HI-SEAL**

## BUTT-JOINT FITTINGS

**now available in brass, steel and stainless steel**



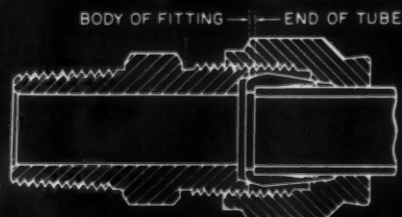
### **HI-SEAL**

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advance in tube  
fittings in 20 years**

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- Withstands higher pressures
- No need to spring tubing
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- Meets J.I.C. and A.S.M.E. standards ... Listed by UL

Tremendous popularity of steel and stainless steel Hi-Seal fittings has led many users to request Hi-Seal fittings in brass. You wanted them—Imperial made them — new brass Hi-Seal fittings . . . plus steel and stainless steel fittings so you can profit from famous Hi-Seal advantages . . . like butt-joint, close bends, quick assembly in the metal best suited to each application.

Tube doesn't enter the body of the fitting. It bottoms on shoulder of the sleeve. Camming action of the nut causes sleeve to form a collet-type triple-seal grip on the tubing.



**Butt-Joint simplifies installation!**

Final circumferential seal is made by tapered edge of sleeve. No tube torquing when making a joint. Can be disconnected and reconnected as often as desired.

Write for Bulletin 3061 and complete facts.

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for fittings and tools for copper, steel, stainless steel, aluminum and plastic tubing. He offers industry's most complete line.

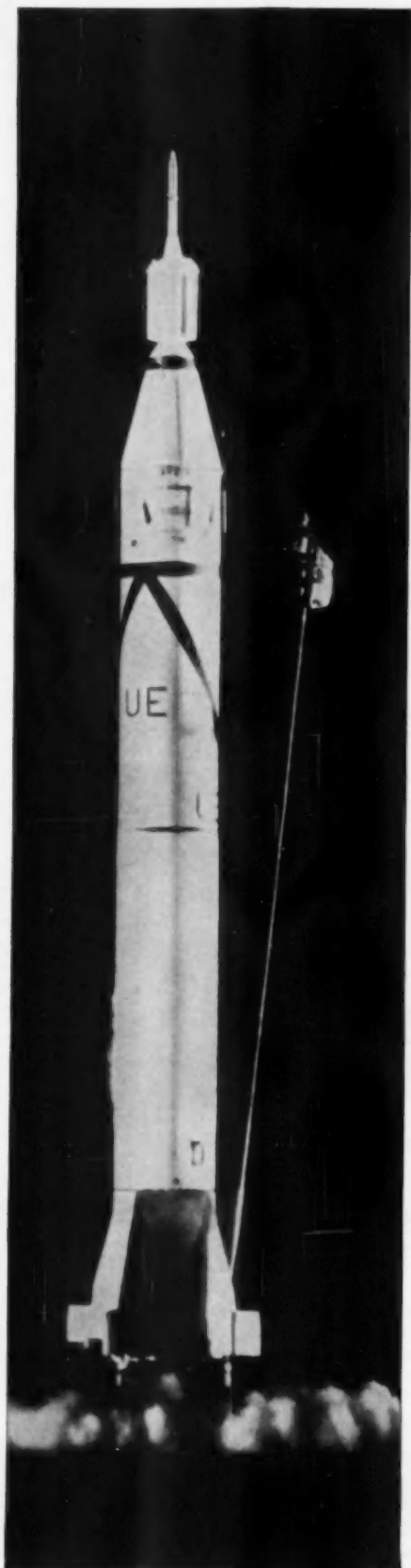
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# Republic Stainless Steel Circles the World

When "Explorer I" was successfully placed in orbit by the U.S. Army from Cape Canaveral on January 31, a new era was opened for the use of Republic ENDURO® Stainless Steel.

Vital instruments in the nose section of the satellite are protected by a cone of stainless steel produced by Republic. This nose cone was fabricated from Type 430 by The Lodge and Shipley Company, Cincinnati, Ohio, using the Floturn Process. By flow-turning, the wall thickness of the cone can be increased in specific areas to comply with design requirements of high temperatures or stresses.

Stainless Steel is highly ductile. It is readily formed into desired shapes by cold-forming, drawing, and bending operations. It provides low thermal expansion and is highly resistant to atmospheric corrosion, erosion, and oxidation at high temperatures.

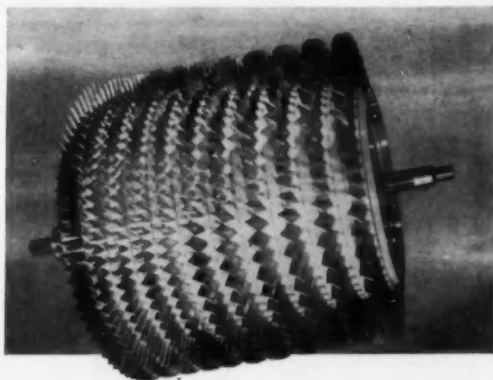
Republic is the world's largest producer of stainless, heat-resisting, and alloy steels. As rapid developments in the fields of supersonic aircraft and missiles increase demand for these high-strength, select formula steels, Republic is keeping pace through research and new production facilities.

Our metallurgists and engineers are always available, without obligation, to work with your personnel in using Republic Stainless Steels, Heat-Resisting Steels, Alloy Steels, and Titanium to best advantage. Check and mail the coupon if you would like a Republic specialist to call at your plant.

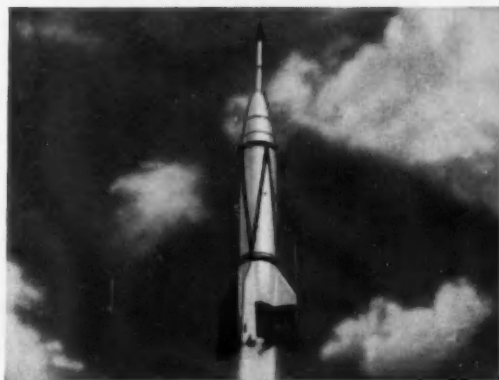
Official U. S. Army photograph shows launching of Jupiter-C Missile and "Explorer I" Satellite from Cape Canaveral, Florida, 10:48 PM, EST, January 31, 1958.



"Explorer I" is positioned on spin launcher. The satellite is spin-stabilized in much the same manner as a rifle bullet. Rotational spin of more than 700 RPM was started on the ground before the satellite was launched. In this Official U. S. Army photograph, the striped area at the top of the Explorer indicates the nose cone fabricated from Republic ENDURO Stainless Steel, Type 430.



REPUBLIC ALLOY STEEL provides high strength and dependable toughness in jet engine compressor rotor discs. In Pratt & Whitney's J-57 jet engine, Republic Hot Rolled Alloy Steel, AMS 6415 (AISI 4340), furnishes the highest strength values—plus an exceptionally high strength-to-weight ratio that permits the design of thinner, lighter sections to save weight and hold down size without sacrifice of strength or safety. The discs are machined from forgings by the Jet Division of Thompson Products, Inc. Forgings are supplied by Wyman-Gordon Company.



REPUBLIC TITANIUM is currently being used for many applications in both aircraft and missiles. Because of its high strength and weight saving factors, titanium has replaced other materials normally used for firewall and nacelle construction. In missiles and rockets it has almost unlimited applications. Titanium's extremely high corrosion-resistance makes it attractive for tanks to hold acids used in combination with missile fuels. Nitric acid, for example, has negligible effect on titanium. It is practically immune to salt water and sea air corrosion. Send coupon for more facts.

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for the Design Engineer...

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Its flexibility cuts costs by eliminating flexible couplings and intermediate fittings, and saving installation labor. Reason why it is used as original equipment on the new "Air Suspension," offered by 1958 motorcars, and is being considered for other automotive applications such as automatic lubrication systems, fuel lines, oil lines, hydraulic systems.

**Outperforms metal.** Chemiseal Nylon Pressure Tubing has exceptionally high resistance to flex and vibrational fatigue. It resists abrasion and impact. Is unaffected by oils, hydraulic fluids, alkalis and most solvents. Has service temperature range from  $-100^{\circ}\text{F}$  to  $+225^{\circ}\text{F}$ . Provides high pressure rating at low cost. Requires no prebending. Utilizes standard metallic flare and compression fittings. Can be installed and fastened around existing equipment. Made in two grades for 1000 psi and for 2500 psi which conform to J.I.C. specifications for low and medium pressures.

For prompt service, contact one of The Garlock Packing Company's 30 sales offices and warehouses throughout the U.S. and Canada, or write for further information.

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Gasket**

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**GARLOCK**



## New Welding Techniques

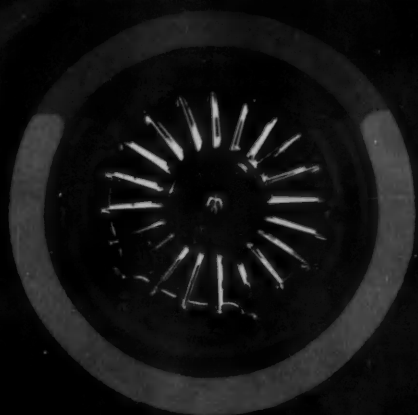
(Continued from page 61)

T-4 condition, it was found that, for the  $\frac{1}{8}$ -in. sheet, a welding speed of 17 ipm resulted in a joint efficiency of 96 per cent, and by combining this with watercooled jaws in the jig for quenching, only an artificial aging treatment was required after welding. Slower speeds in welding, with greater heat input, annealed the weld zone so that it did not respond to heat treatment.

Ernest F. Nippes, Rensselaer Polytechnic Institute, presented the Adams Lecture, upon "The Weld Heat-Affected Zone," describing the complete thermal cycle in the weld zone for ferrous materials and some titanium and zirconium alloys. The effect of welding variables upon time-temperature cycles was determined. Jean Harris and J. J. Riley, Taylor-Winfield Corp., and M. D. Bellware, International Nickel Co., Inc., described studies of the spot welding of Inconel X in thicknesses of 0.032 to 0.188 in. Forge welding of aluminum and magnesium alloys was discussed by Lloyd A. Cook and Donald G. Shafer, Ravens Metal Products, Inc., who stated that cleaning methods, temperatures, pressures, and amount of upset must be closely controlled for each alloy.

### Brazing Alloys

M. D. Bellware, International Nickel Co., described the types of brazing alloys for elevated-temperature service, and their properties. Silver-base alloys show low yield and fatigue strength at temperatures above 500 F, except for an 85-15 silver-manganese alloy that has useful strength to about 750 F. Copper-base alloys have reasonably high strength at temperatures exceeding 1000 F, but because of poor oxidation resistance are seldom used for service above 900 F. Nickel-base brazing alloys possess high strength at temperatures up to or exceeding 2000 F. Addition of chromium to these alloys gives them better oxidation resistance. Although little work has been done with the platinum-base and the palladium-base brazing alloys, they



on the highways tomorrow...

with integral wheel,  
brake drum, hub  
and wheel cover

The Finest Products  
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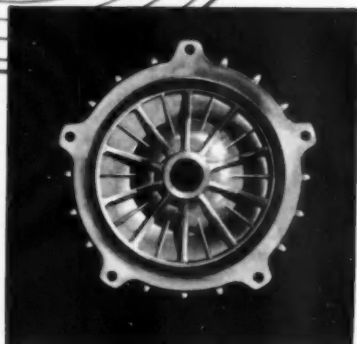
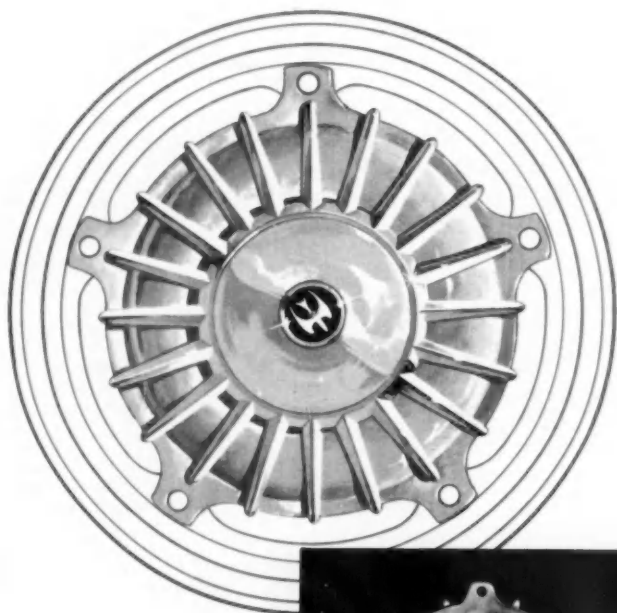
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# Aluminum Wheels

(with integral wheel, brake drum, hub and wheel cover)

offer these important advantages...



**NOTE:** Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.

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- Improved heat dissipation
- Reduced unsprung weight
- Savings in manufacturing costs through application of automation techniques, lower tooling costs, fewer components, reduced inventory
- Increased design freedom
- Unlimited styling approach

*Integral aluminum wheels* are an excellent example of another economical way to achieve better performance with aluminum. Consider these factors:

From a *performance* standpoint, a die-cast integral aluminum wheel is approximately one-third lighter than a steel wheel, hub and brake drum assembly. This reduces unsprung weight and also results in better horsepower to weight ratio—permits designing better steering, riding and performance characteristics into the car. And, aluminum's ability to conduct heat rapidly (proved in aluminum brake drums) assures better heat dissipation.

From a *manufacturing* standpoint, production economies result through reduction of number of components per wheel assembly, reduced inventory, lower tooling costs and reduced machining because closer tolerances are obtained. The high production die casting process is a perfect case for application of cost-cutting automation techniques—techniques that lend themselves better to aluminum than to any other metal.

From a *styling* standpoint, integral aluminum wheels permit countless interesting design variations... help stylists achieve smaller wheels for overall lower appearance. And the possibility of color anodized wheels is another bright thought for stylists to consider.

Remember—on any functional or decorative applications, Reynolds Aluminum Specialists will be glad to work with you to help give you the very most from the aluminum you use. Call the Reynolds Office, listed under "Aluminum" in your classified telephone directory. Or write *Reynolds Metals Company, Fisher Building, Detroit 2, Mich., or P.O. Box 2346-MZ, Richmond 18, Virginia.*

## Reynolds Aluminum

the metal for *automation*\*

\*TRADEMARK

show promise. Strength is somewhat inferior to that of the nickel-base alloys, but they show less tendency toward inter-alloying with the base metal, making them desirable for many applications in the aircraft industry, where thin sections are often encountered.

## BUSINESS PULSE

(Continued from page 98)

rose between 1956 and 1957, even though the aggregate of privately financed starts fell. In the first quarter of this year, some 74 per cent of private starts were financed conventionally, whereas in 1954 and 1955 conventional mortgages accounted for only about half the total. Thus it is possible that the renewed attractiveness of Government programs may witness a realignment away from the conventional mortgage toward the Government-aided mortgage, without substantially raising the total. For the time being, there is no conclusive evidence of developing strength in new-housing activity as a whole.

These various trends do not provide much basis for the expectation that recovery will set in quickly. Unexpectedly early recovery is a possibility, of course, but it would almost certainly require a strong helping hand from the consumer, who so far in the recession has exhibited marked caution.

Catch-all dollar totals of consumption expenditures admittedly do not indicate that consumer spending has been much affected by the recession. Gross national product accounts, for example, show a loss of only \$1.4 billion at an annual rate in total consumer spending from the fourth quarter of 1957 to the first quarter of this year, and they show a similarly small loss from the third to the fourth quarter of last year. But the fractional nature of this decline reflects price increases in part, and it tends to conceal some very important shifts which have been going on within the total.

# NO BUSTED KNUCKLES



## GOLDEN KNURL HOLDS EXACT JAW OPENINGS AUTOMATICALLY!

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\*Soon Available:

716L	720L
<b>16"</b>	<b>20"</b>



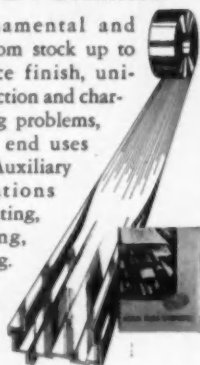
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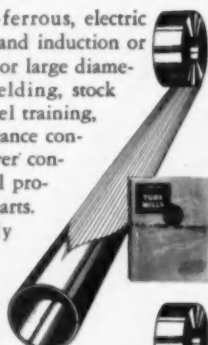
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## More Government Contract Awards

**L**ATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, etc. This list is for the period Apr. 1 to Apr. 30, inclusive.

**AVCO MANUFACTURING CORP.,** Lycoming Div., Williamsport, Pa.  
O-480-1 engines for L-23D aircraft—\$280,222  
T53-L-1 shaft-turbine aircraft engines for the Army H-40 and USAF H-43B aircraft—\$3,600,000

**BELL HELICOPTER CORP.,** Fort Worth, Texas  
HU-1A helicopters, spare parts, ground support equipment and data—\$12,135,000

**BENDIX AVIATION CORP.,** South Bend, Ind.  
Spare parts for B47 aircraft—\$122,676  
Spare parts for B66, RB66, F100, F102, C133, C133A, KC aircraft—\$126,352  
Brake assys for F-101B aircraft—\$658,675  
Wheel assys, main, 53x16, for KC-97 aircraft—\$226,154  
Main wheel assys for C-97, KC-97, and B-50 aircraft—\$950,000

**BOEING AIRPLANE CO.,** Seattle, Wash.  
KC-135A airplanes, spare parts, ground support equipment, training parts and data \$174,866,300

**BUCK & SONS TRACTOR & EQUIPMENT CO.,** Tacoma, Wash.  
Tractor, Ford, Model 641 w/mower; Ford, Model 14-77-16 ea—\$31,284

**CANADIAN COMMERCIAL CORP.,** Washington, D. C.  
U-1A airplanes, Army Liaison, spare parts, ground support equipment—\$3,955,806

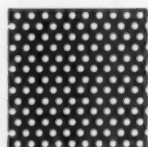
**CHRYSLER MOTORS CORP.,** Detroit, Mich.  
Truck, tank fuel servicing, 1200 gal.—13 ea—\$65,921  
Truck, tractor, w/cab conventional, 5 ton, 4x2—50 ea; chassis truck, w/cab, CA 102, conventional, 3 ton, 4-2-6 ea—\$201,260  
Trucks, 1/2 ton, 4x4, M37B1 series—various quantities—\$14,090,207  
Truck, cargo, 1 ton, 4x4 special power wagon, T-37 (modified) M601, without winch—1073 ea—\$3,074,349  
Automotive spare parts—14 ea—\$30,774  
Truck pickup, 1 ton, 4x4—100 ea; truck, stake, 2 ton, 4x4—3 ea; truck, wrecker, 2 ton, 4x4—1 ea; spare parts ("O" Kit)—100 sets; additional publications—18 sets—\$250,305  
Truck, pickup, 1 ton, 4x4—94 ea—\$217,808  
Truck, tank, water sprinkler, 2000 gal, 5 ton, 4x2—11 ea; chassis, truck w/conventional cab, 6x4—4 ea—\$93,905

(Turn to page 174, please)

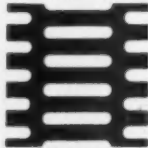
## H&K PERFORATED MATERIALS

for Industrial or Decorative Uses

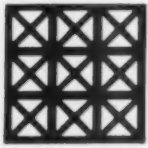
THOUSANDS  
OF  
DIFFERENT  
PATTERNS  
AVAILABLE



Round holes



Oblong holes



Decorative patterns

H & K facilities enable the perforating of all metals, wood, plastics and cloth fabrics. Perforated materials can be furnished in sheets, coils, rolls or plates. Fabricating services include shearing, rolling, welding and forming.

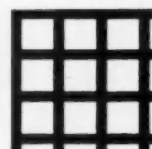
Perforated metal can be ordered with special finishes: aluminum—color anodized or brushed and lacquer finish; steel—painted, chrome plated, enameled, japanned or other baked-on finish. Decorative patterns can be embossed if requested.

Many patterns in steel sheets (industrial or decorative) are in stock at our warehouses. Send for H & K Stock List Brochure.

Write to nearest H & K office today—for General Catalog

**THE Harrington & King PERFORATING CO. INC.**

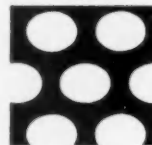
Chicago Office and Warehouse • New York Office and Warehouse  
5630 Fillmore Street 106 Liberty Street  
Chicago 44, Illinois New York, New York



Square holes



Slots



Oval holes



Listed Under  
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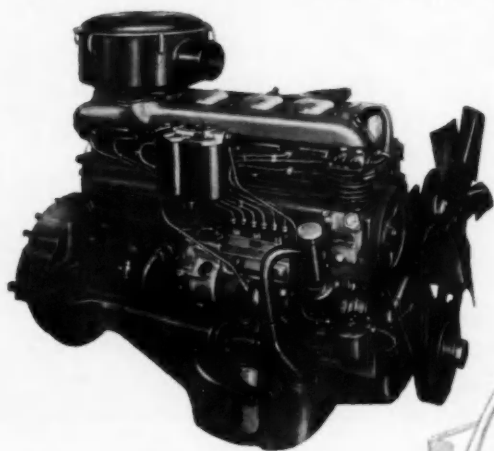
**The Most Advanced Power Plants  
For Over-The-Road Operations!**



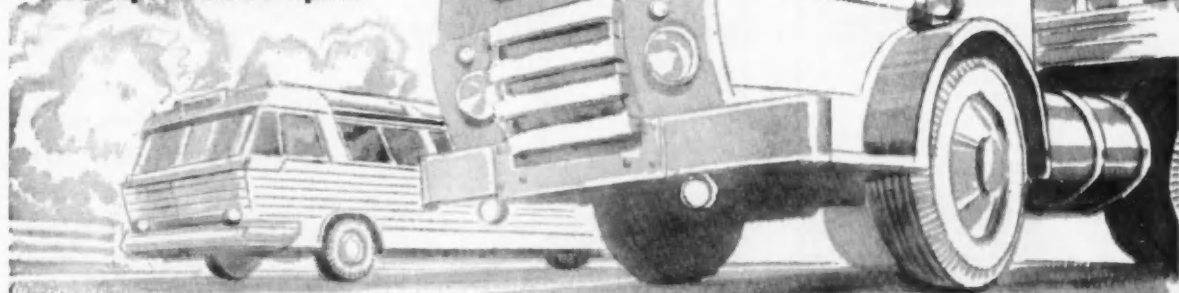
## **MERCEDES-BENZ DIESEL ENGINES**

In all types of over-the-road operations, Mercedes-Benz diesel engines make possible lower operating costs, increased payload capacities, superior road performance and far less off-the-road time for servicing and repairs . . . Because of their ultra-modern design, Mercedes-Benz diesels deliver more horsepower per pound of weight—keep cargos rolling at

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**MODEL OM 326**  
220 h.p. at 2300 r.p.m.



Other Mercedes-Benz diesels  
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cylinders, Turbo and Super-  
charged, up to 3000 h.p.

UTICA DIVISION  
**CURTISS-WRIGHT**  
CORPORATION • UTICA, MICHIGAN



(Continued from page 172)

**INTERNATIONAL HARVESTER CO.**, Washington, D. C.  
Buses—6 ea—\$48,575  
Spare parts for trucks—1 lot—\$19,347  
Trucks—9 ea—\$33,329  
Light trucks—39 ea—\$120,842  
Truck, tractor, 10 ton, 6x4—14 ea—\$125,535  
Truck, maint, telephone utility, 2½ ton, 4x4—1 ea; truck, carryall, 1 ton, 4x4—2 ea; truck, pickup, 1 ton, 4x4 11 ea—\$43,098  
**CHRYSLER MOTORS CORP.**, Washington, D. C.  
Pickup trucks—6 ea—\$13,330  
Light trucks—39 ea—\$33,562  
Trucks—29 ea—\$83,415  
**CINCINNATI MILLING & GRINDING MACHINES INC.**, Cincinnati, Ohio  
Milling machine, 30 in. x 120 in., bed type, 36 in. extra height, complete with selective hand controls and universal automatic combination tracer device—1 ea—\$90,344  
**CONTINENTAL AVIATION AND ENGINEERING CORP.**, Detroit, Mich.  
J69-T-27 engines—\$396,222  
J69-T-19B engines for Q2 aircraft, J69-T-9 engines for T-37 aircraft—\$8,352,373  
**CONTINENTAL MOTORS CORP.**, Muskegon, Mich.  
Multi fuel engine and accessories—40 ea—\$179,000  
Automotive spare parts—39,000 ea—\$30,732  
**DOUGLAS AIRCRAFT CO., INC.**, Charlotte, N. C.  
Nike parts and components—\$71,595  
**DOUGLAS AIRCRAFT CO., INC.**, El Segundo, Calif.  
Airframe structural spares for AD aircraft—various—\$46,179  
**DOUGLAS AIRCRAFT CO., INC.**, Santa Monica, Calif.  
Repair parts for Nike system—\$70,848

**FAIRBANKS MORSE & CO.**, Fair Lawn, N. J.  
Repair parts for Diesel engines—201 ea—\$51,866  
**FAIRCHILD ENGINE AND AIRPLANE CORP.**, Hagerstown, Md.  
C-123B airplanes for RMA case No. OFC/45—\$1,448,969  
**FIRESTONE TIRE & RUBBER CO.**, Los Angeles, Calif.  
Guided missile, surface to surface—\$53,000  
**THE FLEXIBLE CO.**, Loundonville, Ohio  
Buses—2 ea—\$54,548  
**FORD MOTOR CO.**, Dearborn, Mich.  
Automobile, sedan, light, 5 pass.—236 ea; and automobile, station wagon, 8 pass.—34 ea—\$404,289  
Truck, stake-platform, 2 ton, 4x2—100 ea; and sparts parts kit—20 ea; and publications—72 ea—\$242,863  
Trucks, A.B.T., ½ ton and 1 ton, 4x2 1641 ea—\$1,831,635  
Truck, tank, fuel servicing, 2000 gal, 5 ton, 4x2—25 ea—\$180,450  
**FORD MOTOR CO.**, Washington, D. C.  
Buses—11 ea—\$51,087  
Trucks—103 ea—\$319,631  
Automobiles—12 ea—\$18,010  
Trucks and buses—11 ea—\$44,490  
Light trucks—43 ea—\$86,294  
**GENERAL ELECTRIC CO.**, Cincinnati, Ohio  
J79GE Turbojet aircraft engines, less afterburner, removal from Contract J79GE Engs Comp for B-58 aircraft—\$17,840,321  
**GENERAL ELECTRIC CO.**, Johnson City, N. Y.  
AF/A42G-1 automatic flight control systems, initial spares, spare parts, data, ST & TE for F-105 aircraft—\$3,617,800  
**GENERAL MOTORS CORP.**, Detroit, Mich.  
Motor-vehicle parts and accessories, gasoline and Diesel engine parts; con-

struction and road-building machinery parts—Indef qty  
Automotive spare parts—16,192 ea—\$36,756  
M56 vehicles for gun, self-propelled, full-tracked, 90MM, M56 and supporting items—\$12,537,030  
**GENERAL MOTORS CORP.**, Chevrolet Motor Div., Detroit, Mich.  
Buses—3 ea—\$12,198  
Trucks—48 ea—\$122,112  
Truck, maint telephone utility, 2½ ton, 3x2—1 ea; and truck stake and platform, 14,000 GVW, 4x2—199 ea—\$427,586; truck, cargo, pickup, ½ ton, 4x2—254 ea—\$377,636  
Light trucks—215 ea—\$337,576  
**GENERAL MOTORS CORP.**, Truck & Coach Div., East Pontiac, Mich.  
Automotive spare parts—396 ea—\$226,263  
Truck, tractor, 10 ton, 40,000 GVW, 6x4—4 ea—\$155,015  
**GILFILLAN BROS., INC.**, Los Angeles, Calif.  
Furnishing and delivering of depot replenishment repair parts for the Corporal Missile System—(1) \$45,501, (2) \$53,217, (3) \$26,201  
**THE GOODYEAR TIRE & RUBBER CO.**, Akron, Ohio  
Wheel assys—1200 ea—\$181,428  
Aircraft fuel cells applicable to the RF84F aircraft—5 items—\$550,117  
Wheels: main for aircraft—612 ea—\$248,741  
**GRESHAM & CO., INC.**, Kansas City, Mo.  
Truck, stake, 5 ton, steel and wood body—450 ea—\$773,685  
**HOLLEY CARBURETOR CO.**, Detroit, Mich.  
Automotive spare parts—1211 ea—\$27,235  
**HUGHES TOOL CO.**, Culver City, Calif.  
Hughes 269A helicopters, phase IV testing, service support, spare parts—\$477,562  
**KAMAN AIRCRAFT CORP.**, Bloomfield, Conn.  
H-43A and H-43B helicopters, spare parts, ground support equipment, handbooks and technical data—\$9,216,627  
**KESSLER INTERNATIONAL CORP.**, Washington, D. C.  
Spare parts for trucks—1 lot—\$10,099  
**H. W. LOUD MACHINE WORKS, INC.**, Pomona, Calif.  
Spare parts for F80, T33A, F94C, B66 aircraft—\$73,180  
**MCDONNELL AIRCRAFT CORP.**, St. Louis, Mo.  
Quick engine change kits for F101-A, RF 101A, F101C, and RF 101C series aircraft—\$346,310  
**MINNEAPOLIS-MOLINE CO.**, Minneapolis, Minn.  
Tractor, wheeled, industrial—67 ea—\$163,480  
**NAPCO IND., INC.**, Detroit, Mich.  
Automotive spare parts—3963 ea—\$75,217  
**NORTH AMERICAN AVIATION, INC.**, Canoga Park, Calif.  
Rocket engines—(1) \$101,000, (2) \$60,000  
Rocket engines—\$1,650,000  
**NORTHROP AIRCRAFT, INC.**, Hawthorne, Calif.  
Spare parts for F89 aircraft—\$208,142  
**SUNDSTRAND MACHINE TOOL CO.**, Rockford, Ill.  
Transmission assemblies, applicable to support of F-100D/F aircraft—\$923,265  
**WESTERN ELECTRIC CO., INC.**, New York, N. Y.  
Nike spare parts and components—\$319,324  
**WESTINGHOUSE ELECTRIC CORP.**, Philadelphia, Pa.  
Redesigned replacement parts for turbines, various—410 KT—\$133,691  
**WILLYS MOTORS, INC.**, Toledo, Ohio  
Truck, cargo, ½ ton—503 ea; and spare parts kits—100 sets; and publications—72 sets—\$906,617  
Light trucks—24 ea—\$55,853  
Carrier, light weapons, infantry, ½ ton, 4x4, M274—\$65,099  
Tank, fuel for M38A1 jeep 3x4 ½ ton—\$29,522

## COST-CUTTING PRODUCTION TEAM

### MILFORD RIVETS and RIVETERS



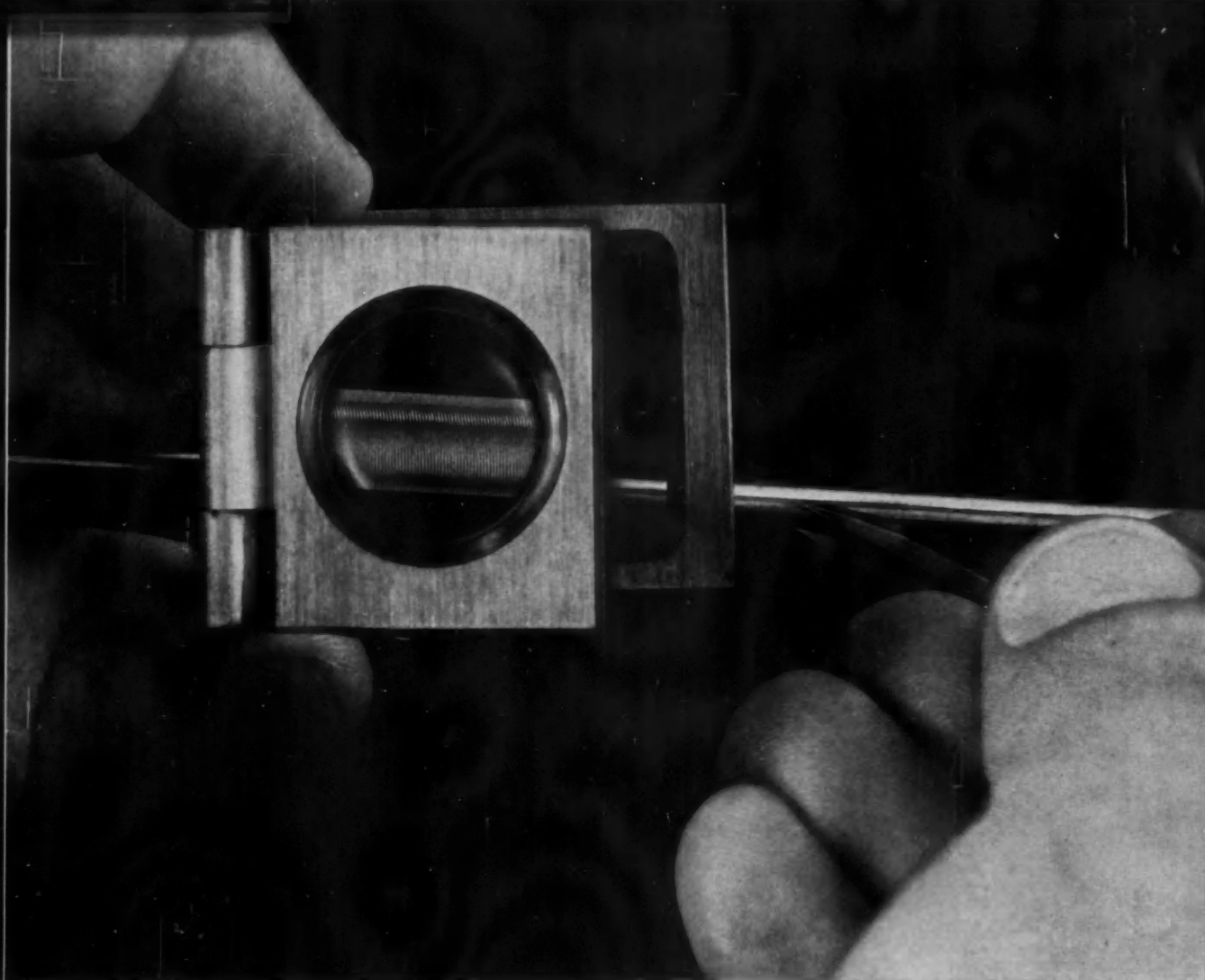
Full or  
Semi-automatic  
Bench or  
Floor Models  
Single or  
Multiple Spindle



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GIVE UNMATCHED SERVICE

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MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA  
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.



## How "high fidelity" in music spring wire licks a big production problem

Leading producers of carbon paper apply the carbon coating by means of steel rods closely wound with hair-fine music wire. The wire-to-wire valleys, as determined by wire diameter, control the amount of carbon deposited.

Here is a case where product quality and smooth, uninterrupted production are both dependent on extreme uniformity in the fine wire being used—

extreme uniformity in diameter, finish and temper.

This super-critical wire is produced by the Worcester Wire Works Division of National-Standard. Because it does the best job by production comparison, it's naturally preferred. Keep this in mind and check with the Worcester Wire Works Division on your next need for fine wire if quality control is at all a factor. You'll get the finest of service, too!

**NATIONAL**  **STANDARD**

DIVISIONS: NATIONAL - STANDARD, Niles, Mich.; tire wire, stainless, music spring and plated wires • WORCESTER WIRE WORKS, Worcester, Mass.; music spring, stainless and plated wires, high and low carbon specialties  
WAGNER LITHO MACHINERY, Bensenville, Ill.; metal decorating equipment • ATHENIA STEEL, Clinton, N. J.; flat, high carbon spring steels • REYNOLDS WIRE, Dixon, Ill.; industrial wire cloth



## The **EASIEST, FASTEST** and **CHEAPEST** WAY TO SHARPEN A DIE is to ... **PUT IT ON A BLANCHARD!**

The Blanchard method of die sharpening is unequalled for speed, safety and economy. All of the dies shown are sharpened on a Blanchard No. 18 Surface Grinder with equal ease.

The rotary work motion of the Blanchard, with the wheel covering the entire surface at each revolution, enables the operator to remove the amount of stock to sharpen the die and no more! This saves time and increases the life of the die, too.

The ample supply of coolant and the ability to use free-cutting wheels permit high grinding speeds without danger of burning the work. This extra speed reduces idle time on the presses.

Many shops use their Blanchards for die sharpening as well as all other surface grinding required in their manufacturing. The 3 Blanchards shown below cover work requirements from finishing tiny gears to roughing steel plates 84" across corners.

Write today for your free copy of **WORK DONE ON THE BLANCHARD**, Fifth Edition and "the Art of Grinding", Fourth Edition.

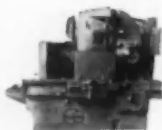


### THE BLANCHARD MACHINE COMPANY

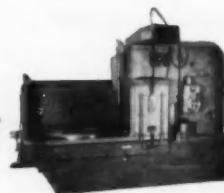
64 State Street, Cambridge, Massachusetts, U. S. A.



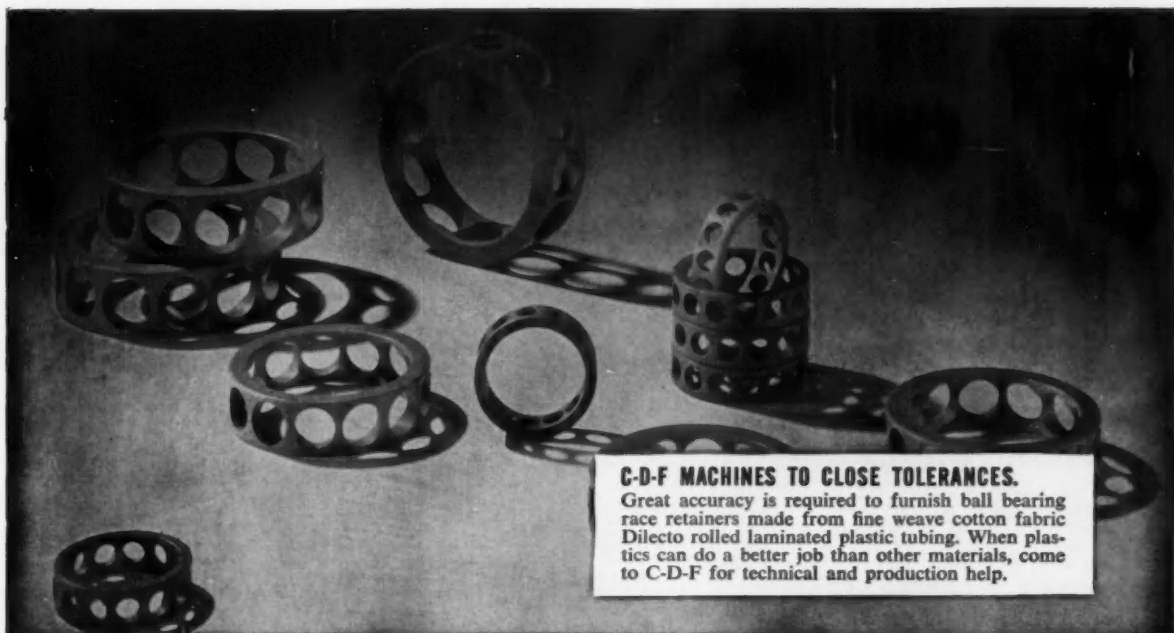
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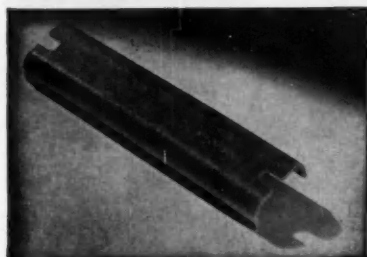


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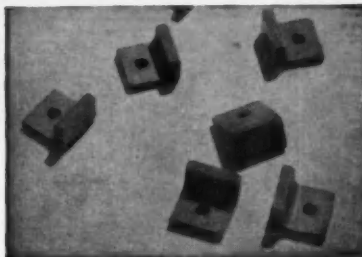


#### C-D-F MACHINES TO CLOSE TOLERANCES.

Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



**C-D-F PIONEERED IN POST-FORMING** of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.

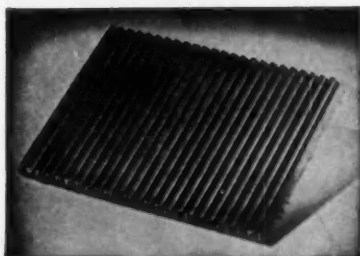


**C-D-F DOES THE UNUSUAL.** These rubbing blocks are made from fine-weave cotton cloth Dilecto molded tubing that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.



**C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING** of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

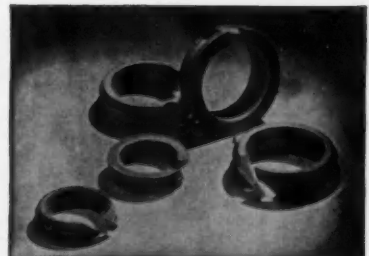
## Yes, C D F is a big reliable source for fabricated plastics!



**C-D-F SERVES MANY INDUSTRIES** with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



**C-D-F IS A PUNCHING SPECIALIST** on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.



**C-D-F COMES UP WITH THE ANSWERS** to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.



### CONTINENTAL-DIAMOND FIBRE

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# SIX GREENLEE'S ON THIS TEAM



## Leading Auto Manufacturer Selects 6 Greenlee Transfer Machines For V-8 Engine Block Precision Machining Line

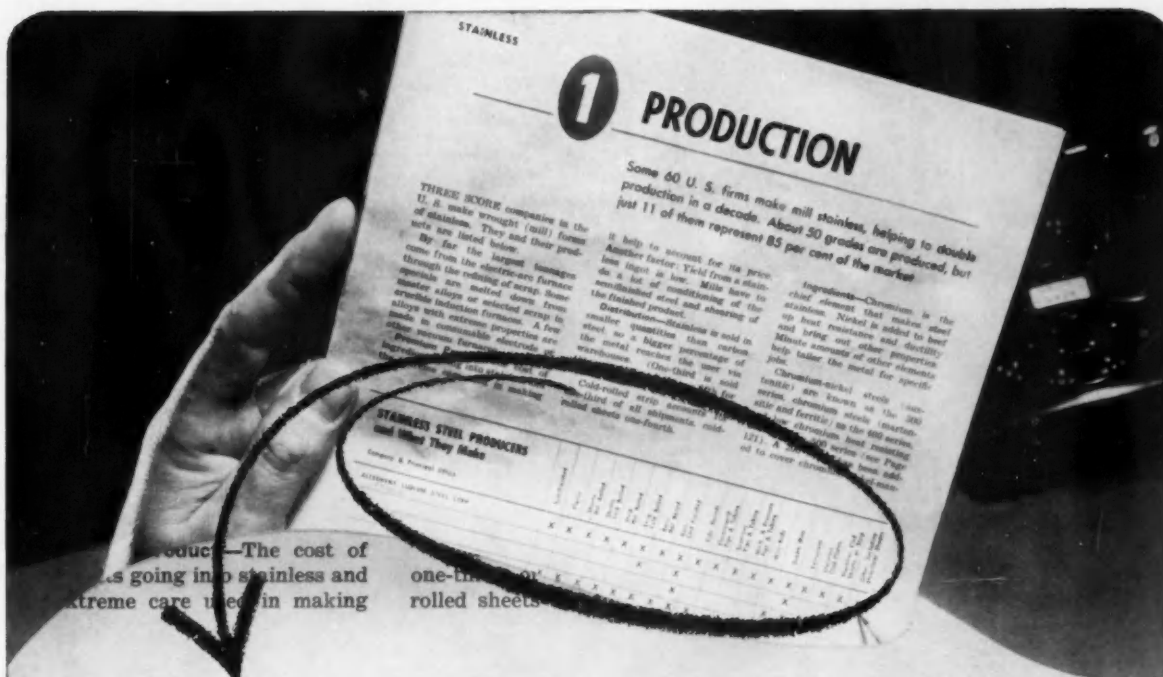
The entire installation has 127 stations and a machined block comes off the line at each cycle. This first unit drills and reams locating holes, mills main bearings to width; mills lock slots, oil seal and slinger grooves, fuel pump and filter pads and rough bores cylinders. It also has a gauging station to check locating holes, a reject station and three turnover stations, the last of which positions the block for the next machine.

WRITE FOR  
COMPLETE INFORMATION

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BROS. & CO.

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Experience—the added alloy in **A-L Stainless, Electrical and Tool Steels**



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Company & Principal Office

ALLEGHENY LUDLUM STEEL CORP.  
Pittsburgh

STEEL, PIPE, TUBING & WIRE

Semifinished	Plates	Sheets, Hot Rolled	Sheets, Cold Rolled	Strip, Hot Rolled	Strip, Cold Rolled	Bars, Hot Rolled	Bars, Cold Finished	Tube Rounds	Electricweld Pipe & Tubing	Seamless Pipe & Tubing	Mech. & Pressure Pipe & Tubing	Wire Rods	Drawn Wire	Extrusions	Stainless Clad Plates	Stainless Clad Sheets or Strip	Other, including Structural Shapes
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
					X		X						X				

Of the 60 producers of stainless steel...

**only ALLEGHENY LUDLUM makes all sizes, shapes, finishes and analyses**

In its November 4, 1957 issue, STEEL magazine published a complete run-down on the stainless steel industry. This article reveals that *only Allegheny Ludlum*, of the 60 some companies making stainless, produces all sizes, shapes, finishes and analyses.

This can save you considerable time and money. When you make Allegheny Ludlum your *one* source of stainless, you work with *one* sales engineer—*one* order, whether you buy sheet, strip, bars, tubing or whatever.

And, at the same time, you get the best technical service. A-L's crack research and development department is continually searching for new alloys, and better ways to use

today's. Its findings are freely available to you through sales engineers, technicians and special literature.

Allegheny Ludlum follows the product from the melt through to finished form, has greater quality control over the stainless you buy. And since A-L makes all forms of stainless, you get unbiased recommendations as to what is best for your individual needs.

Profit by Allegheny Ludlum's status as the only one-source integrated supplier of all stainless forms. Call your A-L representative today . . . see how he can save you money and time. Or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.*

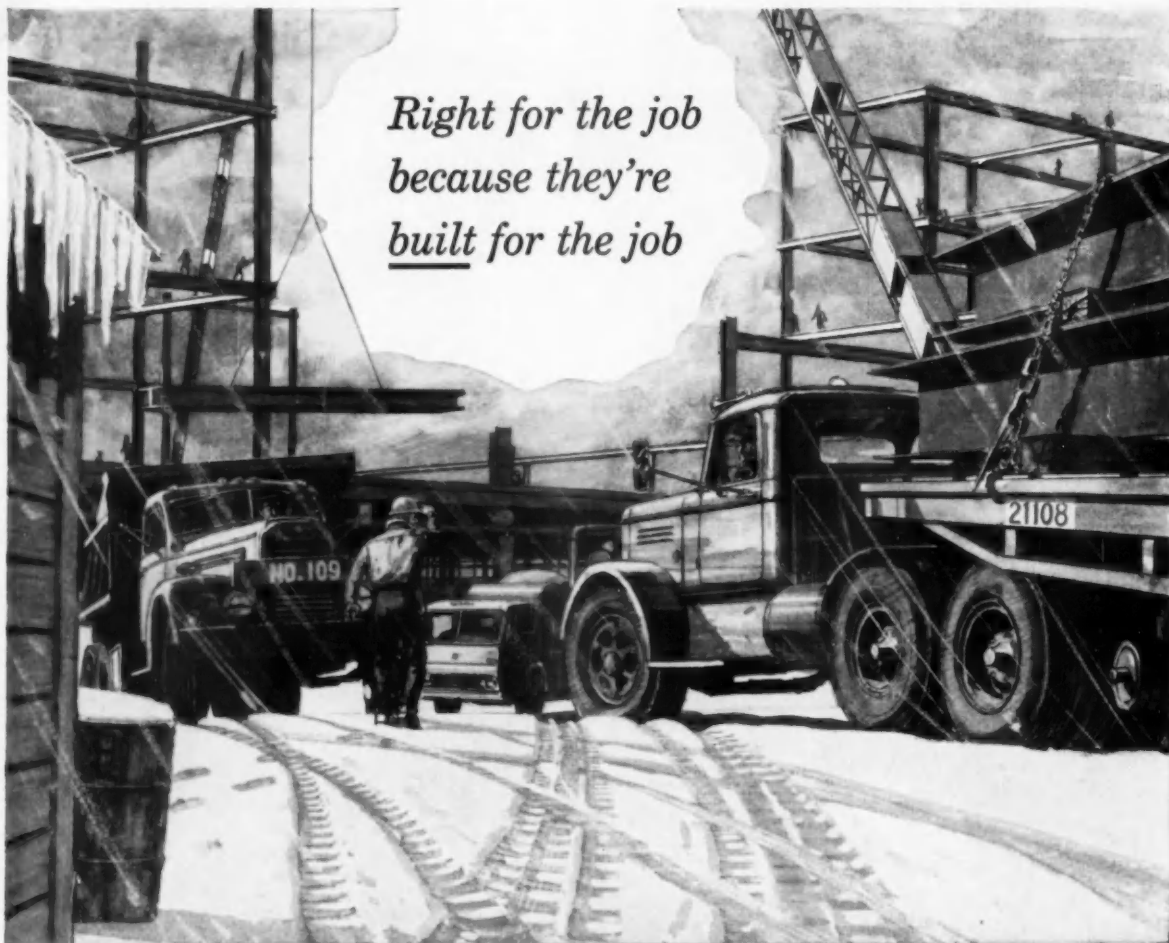
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## EVANS HEATERS ARE RIGHT FOR TRUCKS BECAUSE THEY'RE BUILT FOR TRUCKS

It goes without saying that your truck has to be *truck built* all the way through. Including the heater!

You'll find *every* Evans heater is *truck built*. Each is designed to meet the specific heat and installation requirements of the type truck it is to serve. This means both correct BTU output *and* proper heat distribution . . . something a warmed-over car heater cannot provide.

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An Evans heating engineer will be happy to work with you in solving *your* truck heating problems. Write for complete information: Evans Products Company, Dept. P-5, Plymouth, Michigan.

**Regional Representatives:** Cleveland, Frank A. Chase  
Chicago, R. A. Lennox Co., Inc.; Detroit, Chas. F. Murray Sales Co.  
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### EVANS PRODUCTS COMPANY ALSO PRODUCES:

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Haskelite doors; Evanite Plywall.

**EVANS PRODUCTS COMPANY**

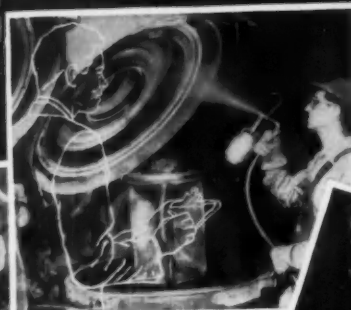
**PLYMOUTH, MICHIGAN**





**HOW THE SILICONES MAN HELPED—  
Stop Costly Water Damage in**

In about 1945, the U.S. Navy's Naval Air Station at Alameda, California, was planning to build a new hangar. The hangar was to be built on a site that had been used for many years as a water storage tank. The water in the tank was so old that it had become acidic. This acid water was so corrosive that it had eaten through the concrete of the tank. The hangar was to be built on the site of the tank, and the acid water was so corrosive that it had eaten through the concrete of the tank. The hangar was to be built on the site of the tank, and the acid water was so corrosive that it had eaten through the concrete of the tank.



**HOW THE SILICONES MAN HELPED  
BUILD THE PATTERN OF A TIRE TREAD**

The tread design on a tire is a pattern of grooves and sipes that help the tire grip the road. The pattern of a tire tread is a pattern of grooves and sipes that help the tire grip the road. The pattern of a tire tread is a pattern of grooves and sipes that help the tire grip the road. The pattern of a tire tread is a pattern of grooves and sipes that help the tire grip the road.



**HOW THE SILICONES MAN HELPED  
SEAL & STOP FOR STRAIGHT ENGINEING!**

Sealing is a critical part of many industrial processes. The Silicones Man helps with sealing in many ways. The Silicones Man helps with sealing in many ways. The Silicones Man helps with sealing in many ways. The Silicones Man helps with sealing in many ways.

**HOW THE SILICONES MAN HELPED—  
Deliver a Hot Blast to Cold Jets!**

Delivering a hot blast to cold jets is a challenging task. The Silicones Man helps with this task in many ways. The Silicones Man helps with this task in many ways. The Silicones Man helps with this task in many ways. The Silicones Man helps with this task in many ways.



## HAVE YOU MET THE SILICONES MAN?

He'll tell you the story of the "impossible" rubber that helps deliver a hot blast to cold jets... or the case of the 3600 mph wind tunnel. Perhaps you'll want him to tell how he helped seal a delicate gyroscope... or show you the brick that floats. Here's a man with a thousand success stories about UNION CARBIDE Silicones.

But the Silicones Man is in reality many men—in sales engineering, technical service, research, and development—all working together as the Silicones Division of UNION CARBIDE. Between them they possess tremendous knowledge about the wonderful world of silicones. There's a Silicones Man in most major cities. Put him to work on your problems today. For a complete description of many silicone products, write for the booklet "Look to UNION CARBIDE for Silicones," Dept. EB-0701  
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The term "Union Carbide" is a registered trade-mark of UCC.  
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Need help to reduce your manufacturing costs and raise your production? Why not check Federal/Warco Packaged Production Lines — automated production from coil strip or sheet blanks to finished product.

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Federal pioneered and are leading designers and builders of packaged lines. Talk with a Federal representative when next you're planning production welding or press equipment.

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120,000 of these  
detonator plugs  
*equal*  
one 73 lb.  
bumper strip



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**ORCO**

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The precision pigmy component weighs less than  $\frac{3}{10}$  of a gram and is an important part of a delicate detonator assembly. The 73-lb. bumper strip is a protective part of a "Dodgem" car in amusement parks.

Big difference in size and application? Sure, but Ohio Rubber is recognized as a producer of "customeered" parts made from rubber, synthetic rubber, silicone rubber, polyurethane, and flexible vinyl, in *all sizes*, for any application, and whether molded, extruded, or bonded to metal.

From design through electronically controlled compound mixing and production facilities in four plants, Ohio Rubber's integrated set-up is prepared to handle your most exacting rubber and vinyl component requirements. Let ORCO engineers help on your next problem. See how ORCO CUSTOMEERING can work to your greater advantage.



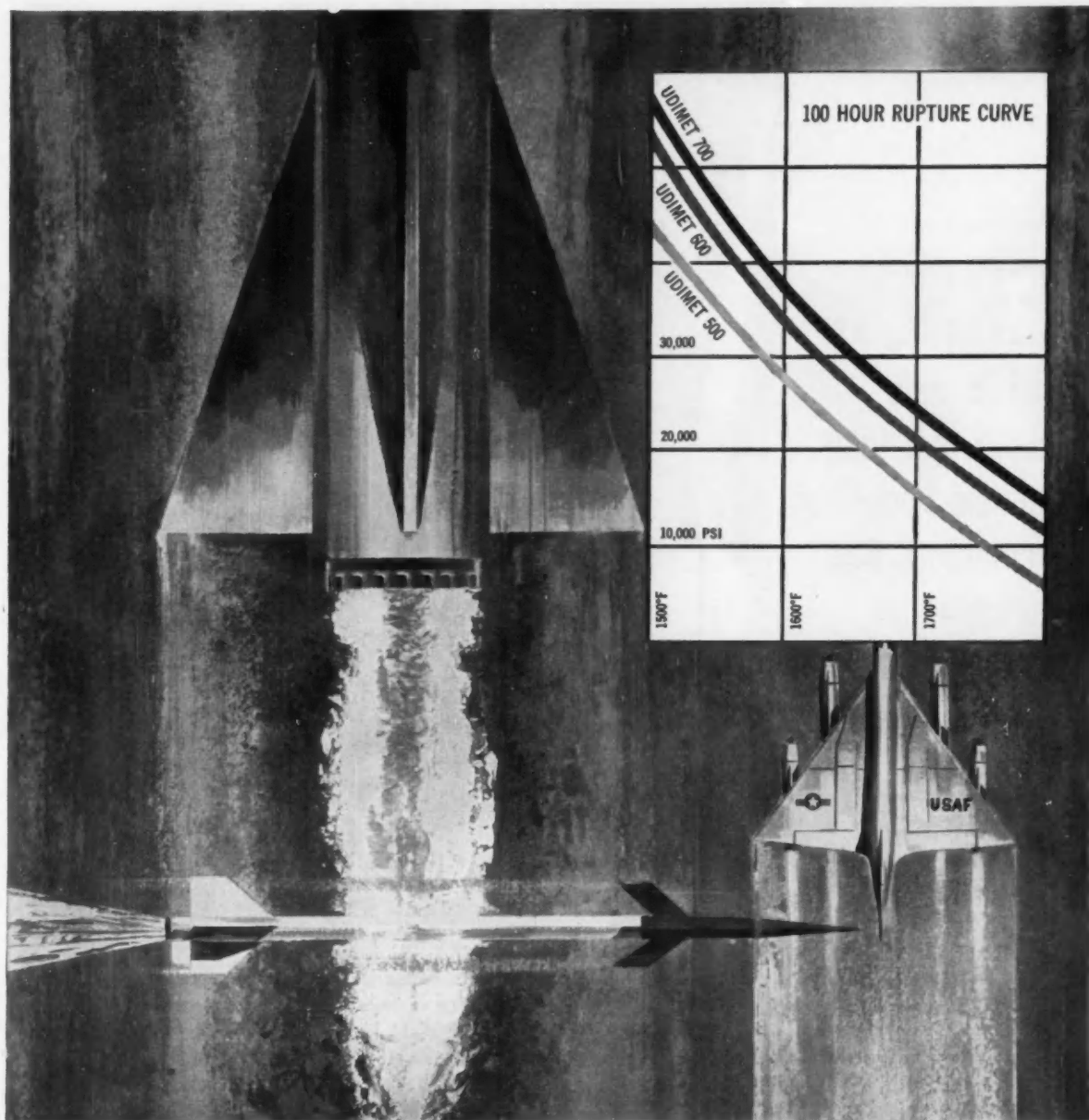
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**THE OHIO RUBBER COMPANY**

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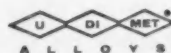


*Udimet 600 is now available in production quantities. Udimet 700 is available for development applications.*

## announcing Udimet 600 and 700

for a wider range of applications at elevated temperatures!

The Utica Metals Division of Kelsey-Hayes scores another materials "break through" with vacuum induction melting. Producing only by the vacuum induction melting process, Udimet 600 and 700 surpass the elevated temperature properties of any other known alloy which can be produced in quantity for critical high-temperature, high-stress requirements. They not only possess excellent stress-rupture qualities but also exhibit high tensile strength at temperatures above 1500°F. Kelsey-Hayes Company, General offices: Detroit 32, Michigan.



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Many vacuum induction melted metals and alloys can now be produced in heat sizes up to 5,000 lbs. by Utica Metals Division.

Some alloys covered by U.S. Patent #2809110

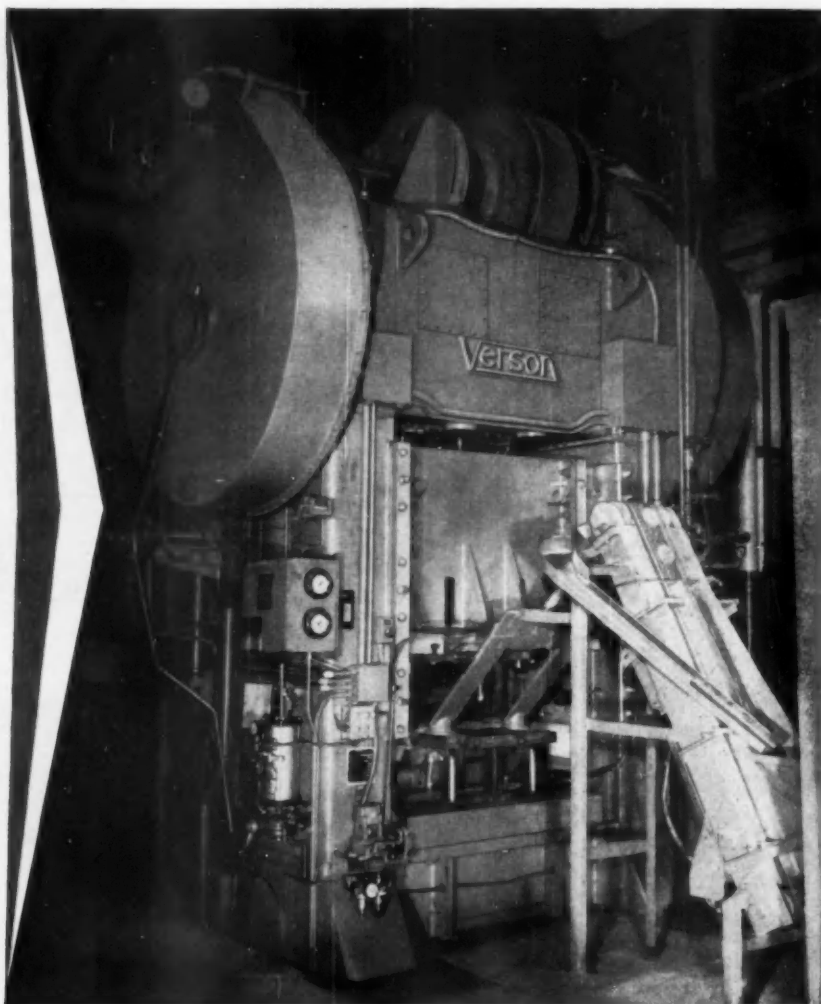
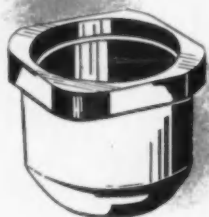
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 17 PLANTS: Detroit and Jackson, Mich.; Los Angeles; McKeesport, Pa.; Springfield, Ohio (Speco Division); Utica, N. Y. (Utica Drop Forge & Tool Division); Davenport, Iowa (Farm Implement and Wheel Division); Philadelphia (Heintz Division); Windsor, Ontario, Canada.

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**PRESSES** help  
produce ball joint  
suspension housings  
for complete line  
of automobiles



Six Verson Presses are important components of a unique production line recently installed at a plant of a major automotive manufacturer. The entire setup is devoted to producing upper and lower housings for ball joint suspension systems on a complete line of automobiles.

Shown above is the cupping press which handles the first forming operation on material previously blanked and ground from strip stock. This press processes two sizes of blanks which ultimately become two sizes of upper and lower ball joint housings.

Press capacity is 200 tons; stroke is 10"; operating speed, 30 SPM. Two parts are produced per stroke. Feeding of blanks and discharging of finished form cups is completely automatic. The feed unit orients and feeds the blank. The die unit is constructed with safety circuits which shut down the equipment in the event of tool failure or misfeeding of blanks.

Whether your requirements call for a single press or a fully automated press line, Verson engineers can show you how Verson Presses can do the best job at lowest cost.

186

A Verson Press for every job from 60 tons up.



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as **LIGHT** as aluminum  
— **WEARS** like iron

Unretouched photo of VANASIL piston

MICRO-X VANASIL pistons have run way over 200,000 miles with only .002" to .005" wear on the top ring grooves. How much wear develops in top ring grooves on the pistons you are using—in 100,000 miles? In 200,000 miles, if they are ever run that far?

Do your owners have rings break because of badly worn grooves, causing a breakdown on the road and a costly tow-in job as well as lost time and an engine overhaul? *Vanasil Pistons reduce top ring groove wear up to 75%!\**

You Get **ALL** these Advantages only in

## VANASIL PISTONS

G & E's proved Vanadium — High Silicon — Aluminum Alloy

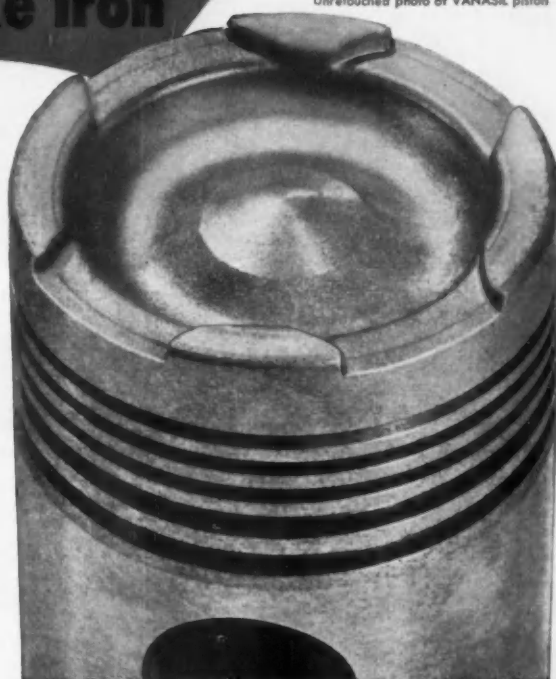
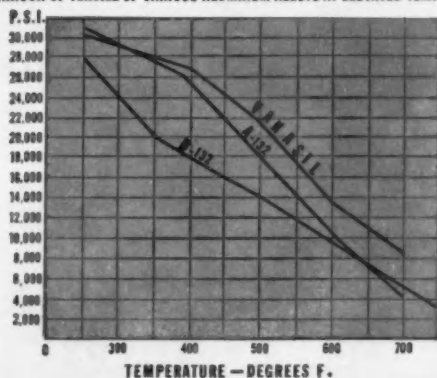
1. **LIGHT WEIGHT**—Same as other aluminum alloys.
2. **SCORING, SCUFFING MINIMIZED**—Because of "Oil-absorbing" microscopic porous texture.
3. **LONGER LIFE** — 30% less friction — 30% harder. Greater "hot" strength—see chart below.
4. **TOP RING**—Breakage virtually eliminated because of reduced ring groove wear.
5. **LOW EXPANSION**—Characteristics of Cast Iron.
6. **CLOSE CLEARANCES**—Fitted with Cast Iron Clearances.
7. **SOLID SKIRT DESIGN**—No expansion devices required.
8. **HIGH HEAT CONDUCTIVITY**—Similar to other aluminum alloys.
9. **GRAIN GROWTH**—None.
10. **PLATING**—No tin or other break-in coating required.

### VANASIL Piston Warehouse Stocks:

CALIFORNIA—Automotive & Industrial Wsh. Co., 1341 So. Hope St., Los Angeles 15; Piston Supply Warehouse, 2768 Grove St., Oakland 12

NEW YORK—Bethlehem Equipment Co., 109 W. 64th St., New York 23

A COMPARISON OF TENSILE OF VARIOUS ALUMINUM ALLOYS AT ELEVATED TEMPERATURES



**MICRO-X**  
**VANASIL**  
**PISTONS**  
for Gasoline and Diesel Engines

\*Gillett & Eaton's trademark for a micro-silicon, high silicon, aluminum alloy

GILLETT & EATON, INC. • Est. 1868  
841 DOUGHTY ST., LAKE CITY MINNESOTA

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GILLETT & EATON, INC.  
841 Doughty St., Lake City, Minn.

Please send circular and prices on Vanasil Pistons in over 60 types and sizes for gasoline and diesel engines.



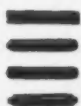
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*Oldest in age  
Still in  
the lead*

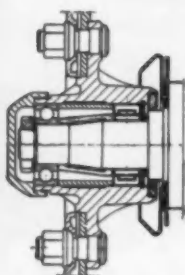
loose needles



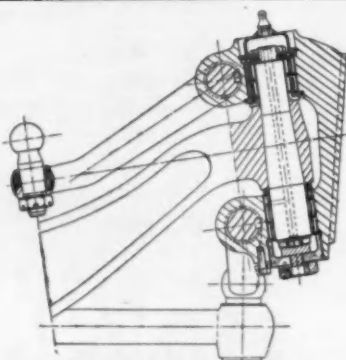
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complete bearings



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KING PIN (FRONT AXLE)



CONNECTING ROD



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NEEDLE BEARINGS

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the "Low Cost" Requirements  
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# GITS

*World's  
Largest Selection of*  
**LUBRICATING DEVICES**



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Shoulder Drive

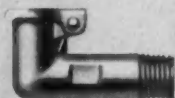
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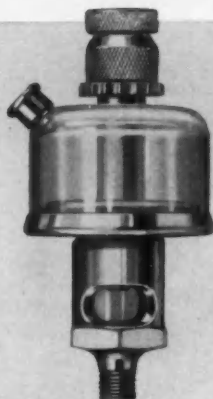
Style G — No. 505  
Beaded Drive



Style GB — No. 527  
Ball Valve



Style L — No. 1204  
Brass Elbow (Threaded)



## SIGHT GRAVITY FEED OILERS

Rate of oil flow regulated by needle valve, directly observed through sight glass in stem.

Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.



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This oil gauge plug permits instant checking of oil level within a transmission or gear case. For use where construction permits insertion in tapped hole. A valuable addition to any such equipment—at very low cost. Style BW—No. 4042.

## GEAR CASE GAUGES



Screw mounted, to set flush. Glass port is backed with white enameled reflector, to make oil level (in gear case or transmission) readily visible, even in dim light. Style CW — No. 4032.

## SIGHT GAUGES

For use where rate of oil flow must be regulated to suit changing operating conditions.

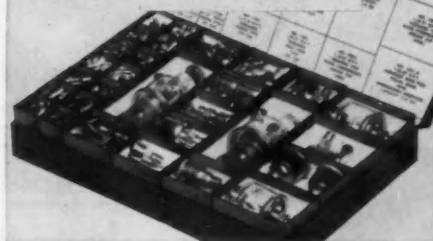
Needle valve permits extremely accurate adjustment of oil feed.

Sight glass provides direct observation of rate of oil flow. Accuracy and convenience at a moderate price. Style PF—No. 4290.



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for safe operation of brakes**

Your customers have a continuous, dependable source of air for the operation of brakes and other air powered devices when you equip your vehicles with high volume, efficient Wagner Rotary Air Compressors.

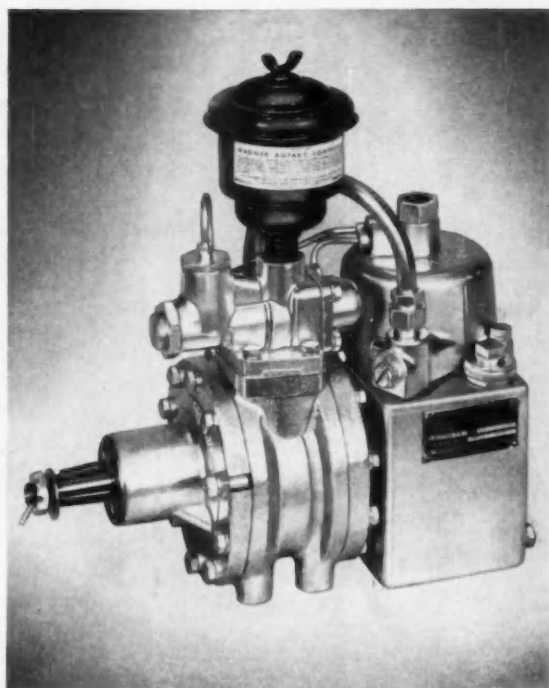
**With either 9 or 12 c.f.m. Wagner Rotary Air Compressors you provide these additional performance features:**

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**FAST RECOVERY OF PRESSURE**—Rotary compression forces all air from the compression chambers. Such high volumetric efficiency means rapid air pressure recovery at all compressor speeds.

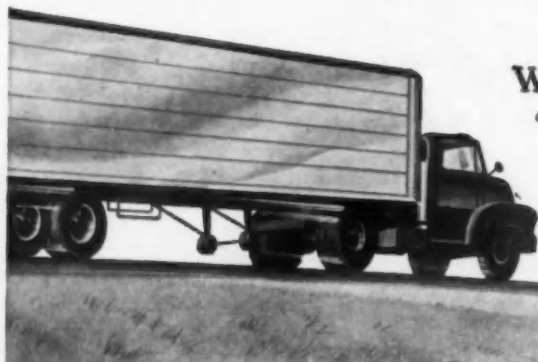
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**SMOOTH, QUIET OPERATION**—Thousands of small overlapping air compression impulses per minute maintain a uniform load and assure smooth, quiet operation with long belt life.



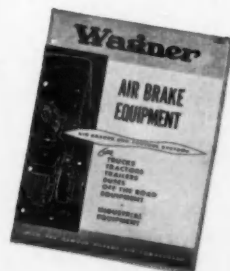
**GET ALL THE FACTS** on the Rotary Air Compressor and details on complete Wagner Air Brake Systems and Equipment for trucks, tractors, trailers, buses and off-the-road equipment...ask for Catalog KU-201.

WK58-7A



**Wagner Electric Corporation**

6363 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.



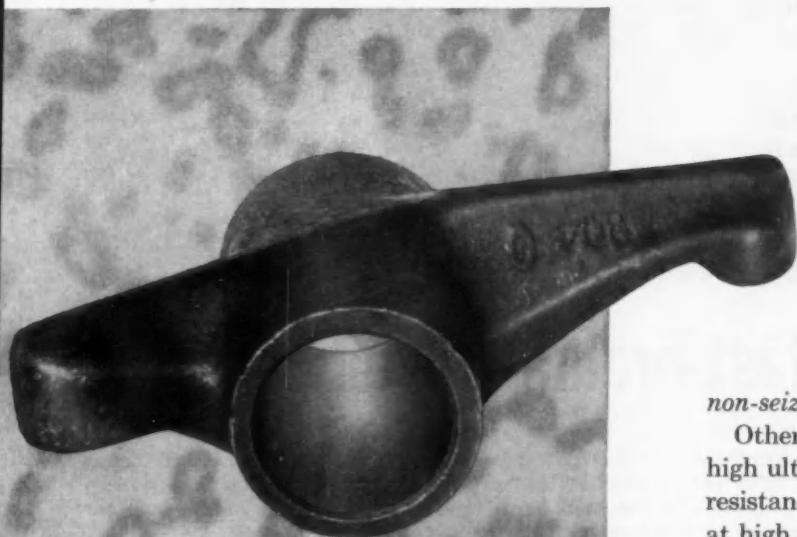
LOCKHEED BRAKE PARTS, FLUID, EXCHANGE SHOES and LINING • AIR HORNS • AIR BRAKES • TACHOGRAPHS • ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES

*is your problem*

# bearing surfaces?

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*are the answer*



Sleeve bearings and bushings are expensive at best. Often they're unsatisfactory, too. May lead to service and lubrication problems. Frequently you can whip these problems at one fell swoop—by specifying HTM (Pearlitic Malleable) castings because of their *excellent,*

*non-seizing bearing properties.*

Other advantages of HTM castings are high ultimate strength . . . extreme wear resistance under heat and heavy loads at high speeds . . . air or liquid quenching . . . ability to be smooth-finished.

So when you're looking over the materials field, don't overlook the advantages of HTM castings. For HTM metal can be cast by either the shell mold, CO<sub>2</sub>, or green sand methods. This means production costs tumble . . . performance and saleability of your product go up.

AA-6921

**NATIONAL MALLEABLE and STEEL CASTINGS COMPANY**

*Established 1868*

*Cleveland 6, Ohio*

*The nation's largest independent producer of malleable and pearlitic malleable*

#### *Important Physical Properties*

Brinell	163 to 302 *
Yield, psi	48,000 to 85,000 *
Ultimate, psi	70,000 to 110,000 *
Elongation, %	7 to 2 *

*\*Depending upon grade*

## ANOTHER EXAMPLE OF HOW CONTINUING RESEARCH KEEPS R/M FIRST IN FRICTION



A few of the wide variety of shaped friction parts made by R/M

## How to tame a "fast-braking" friction curve

When friction material problems throw you a bad curve, because of fade wear or noise, let R/M go to bat for you!

No matter what the shape, size or application, you can rely on R/M for the solution to your friction problem.

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and produced every conceivable shape and kind of friction material. Friction parts range from clutches, brake blocks, linings, and automatic transmission components to tiny friction members in aircraft. This experience can be yours.

And you can always rely on completely unbiased recommendations when you consult R/M. Because only R/M makes all types of friction materials.

An R/M sales engineer can be at your desk within 24 hours to help you with any friction problem.

Next time you're at bat, and friction throws you a bad curve, let R/M help you with the answer. Profit from our experience!

Write now for your free copy of R/M Bulletin No. 500. Its 44 pages are loaded with practical design and engineering data on all R/M friction materials.

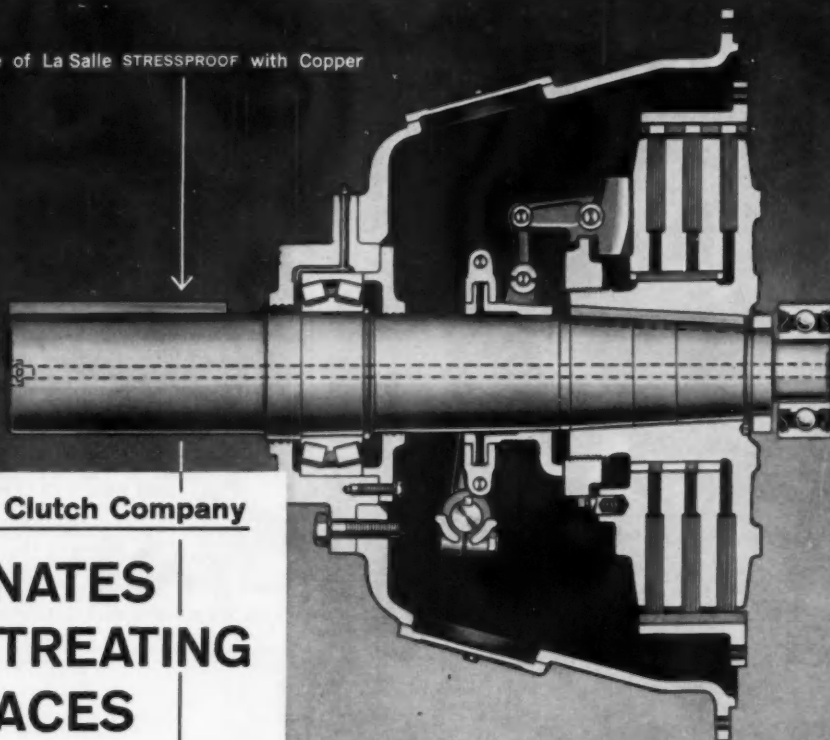


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Shaft Made of La Salle STRESSPROOF with Copper



**Twin Disc Clutch Company**

## ELIMINATES HEAT TREATING FURNACES

by using

**STRESSPROOF®**

with copper

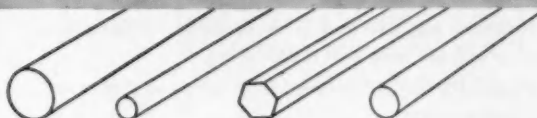
## STEEL BARS

In Racine, Wisconsin, Twin Disc Clutch Co. saved money on a plant addition by eliminating heat treating furnaces . . . and they continue to save on part costs by using a material which needs no heat treatment . . . STRESSPROOF.

On the strength of over 15 years' experience with STRESSPROOF, Twin Disc knew they could cut their costs by purchasing this material which has the necessary properties in the bar.

They produce about 150 different models of power take-off shafts . . . see cross-section drawing. These shafts must possess great toughness and have the strength to take heavy loads. They must resist wear at the journals. Because one end of each shaft must be machined to individual customer specifications, machinability is important. Warpage after machining cannot be tolerated.

Twin Disc power take-off unit  
Used to transmit power from industrial internal combustion engines.



STRESSPROOF with copper fills these requirements on all counts because it has these four qualities in the bar: (1) Strength without heat treating. (2) Machinability (copper further improves machinability). (3) Excellent resistance to wear. (4) Minimum warpage.

By using STRESSPROOF, Twin Disc eliminates the cost of heat treating, cleaning and straightening. Working conditions are better . . . the plant is cleaner and cooler, and floor space requirements are less. Time and money consuming production steps are eliminated.

Twin Disc gets better parts at lower cost, and perhaps you can profit by their experience. Unless you have investigated STRESSPROOF recently, you may be overlooking worthwhile savings, especially since copper has now been added to improve machinability.

Available from your Steel Service Center.

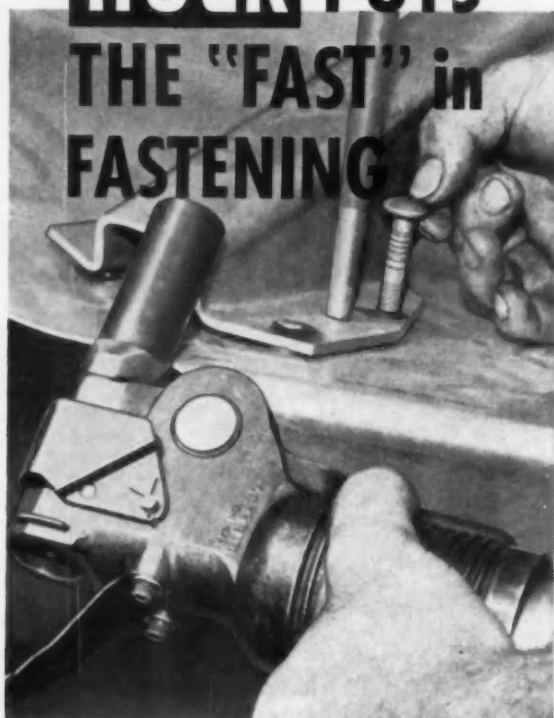
**La Salle** STEEL COMPANY  
1438 150th Street, Hammond, Indiana



Please send literature describing La Salle STRESSPROOF with copper.

name \_\_\_\_\_  
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company \_\_\_\_\_  
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city \_\_\_\_\_ zone \_\_\_\_\_ state \_\_\_\_\_

# HUCK PUTS THE "FAST" in FASTENING



Whether you are interested in fasteners that will hold permanently "fast" or are "fast" to install, HUCK gives you both.

Nowhere can you find so many desirable features as you'll get with HUCK FASTeners.

**POSITIVE MECHANICAL LOCK**—can't slip, strip or wear loose.

**UNIFORM INSTALLATION**—Every fastener identically tight, automatically "torqued" by the installing tool.

**TIME SAVING**—Easily installed by unskilled labor up to ten times faster than ordinary fasteners.

**NO BUCKING**—Whether headed or blind type, the tool "pulls" fastener tight from work side.

**NO WORK DAMAGE**—Tool never touches work, can't dent, gouge or scratch the product.

**EASILY REMOVED**—Simple tools afford fast removal without damage to product.

**ECONOMICAL**—Installed cost is below most ordinary fasteners.

Huck fasteners are made in many types, sizes and materials. A Huck fastening specialist will gladly point out the one best suited for your needs and demonstrate their advantages on your product in your own plant. We invite your inquiry.

## HUCK

MANUFACTURING COMPANY

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**Stops Losses  
making Dies and  
Templates**



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.



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### CUT SCRAPER TIME

**END NIGHT CLEANUP & MORNING REBLUING**



DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

**THE DYKEM CO., 2301-L NORTH 11TH ST., ST. LOUIS 8, MO.**

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is read by general executives,  
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## Thank You, Sincerely!

To the many friends, business associates, progressive contemporary engineers and scores of others who, during the twenty-one long years from the beginning of our experimental work to the final successful production of a thoroughly tested four cycle cam-type reciprocating engine accepted by the C.A.A., have sustained us with material assistance and understanding encouragement; we extend our sincere, deep and heartfelt gratitude. To you belongs much of the credit for making America's first engine of its type a reality.

**Karl L. Herrmann**

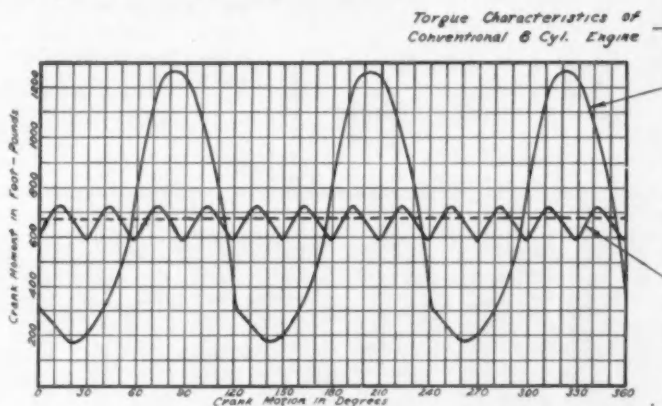
## At long last, the Herrmann CAM ENGINE is a proven fact!

This totally new concept in cam-type reciprocating engine design has changed the thinking of experienced engine designers everywhere, and has touched off a wave of incredulous comment akin to that heard when Fulton, Edison, Bell and others succeeded in doing things that couldn't be done.

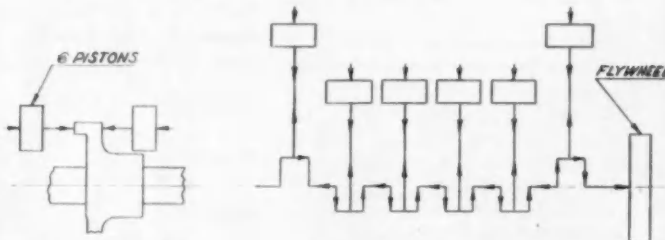
The Herrmann 200 H.P. Cam Engine is designed for use in light planes, trucks, busses, tractors and stationary or marine installations. It is now available to manufacturers of original equipment, on a franchise basis.

A few of the many exclusive features of the C.A.A. Approved Herrmann engine are:

1. Centrifugal forces are eliminated and reciprocal forces are offset near their source.
2. Contains many valuable demonstrable major improvements not possible in conventional engines.
3. It uses only one half as many parts. In this phenomenal engine you will find a powerful responsiveness with never-before-possible economy. Original as well as upkeep costs are drastically reduced because it has no crankshaft, no valve camshaft, no connecting rods, no rocker arms, no push rods, no vibration damper and no counterweights. Weight is about 50% that of comparable H.P. conventional engines.



Cam engine impulses overlap and obtain a relative uniform torque. Impulses of a similar H.P. six cyl. conventional engine drop practically to zero three times per shaft revolution.



**STRESS PATH**  
**HERRMANN ENGINE**

**STRESS PATH**  
**CONVENTIONAL ENGINE**

Stress paths back and forth from piston to propeller of both crank and cam engines. In addition to the normal stresses of the crank engine, there are tremendous increases in material stresses and bearing loads due to torsional vibration of the flexible crankshaft which cannot be shown in a graph of this type.

*Interested parties are invited to write for further technical details to*

**KARL L. HERRMANN** 1405 Air-Way  
GLENDALE 1, CALIFORNIA

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**USE  
THE  
FINEST!**

Specify Vellumoid for the finest in gaskets and gasket sets . . . job matched to your specific requirements. Vellumoid now offers Cylinder Head, Manifold, Exhaust Flange Gaskets and Overhaul Sets to assure trouble-free superior performance.

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Worcester, Massachusetts



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**CONTINENTAL Certified DRILLS**

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DRILL CORPORATION**  
555 W. Adams St., Chicago 6, Illinois

\* \*

*Quantity*  
**PRODUCTION**  
*of*  
**GREY IRON CASTINGS**

\*  
**ONE OF THE NATION'S  
LARGEST AND MOST MODERN  
PRODUCTION FOUNDRIES**

\*  
**ESTABLISHED 1866**

**THE WHELAND COMPANY**  
**FOUNDRY DIVISION**

**MAIN OFFICE AND MANUFACTURING PLANTS  
CHATTANOOGA 2, TENNESSEE**

\* \*

# NEW

NEW

NEW

ESPECIALLY DESIGNED FOR TOP RING  
GROOVE PROTECTION IN PISTONS  
FOR GASOLINE ENGINES

AN ECONOMICAL METHOD WITH  
MINIMUM WEIGHT INCREASE

CAN BE APPLIED TO ANY TYPE  
ALUMINUM ALLOY PISTON



## PERMA-GROOVE\*

WITH SEGMENTAL STEEL TOP RING SECTION

Again, Zollner engineering leadership provides another great piston development to engine builders. The new Zollner "Perma-Groove" gives sensationally longer life to pistons and rings, prevents blow-by, minimizes oil consumption. The light weight segmental steel section incorporates high wear resistance in the top ring groove *plus* the advantage of cool operation. Designed especially for gasoline engine pistons, "Perma-Groove" is the quality, low-weight and low-cost companion to the popular "Bond-O-Loc" piston for Diesel engines. We suggest an immediate test of "Perma-Groove" advantages for your gasoline engine.

\*T. M. Reg. Pat. App. For



TOP RING SECTION



FRONT VIEW SECTION



CROSS SECTION

### OUTSTANDING ADVANTAGES OF ZOLLNER "PERMA-GROOVE" TOP RING SECTION

1. Individual steel segments eliminate continuous band expansion problem.
2. Segments securely locked to prevent radial movement.
3. Dovetailed edges keep steel segments securely in plane with groove.
4. 75% steel bearing area for wear resistance.
5. 25% aluminum bearing area for heat conductivity and cool operation.
6. Light in weight.

ADVANCED  
ENGINEERING  
PRECISION  
PRODUCTION  
COOPERATION  
WITH ENGINE  
BUILDERS

ZOLLNER

PISTONS

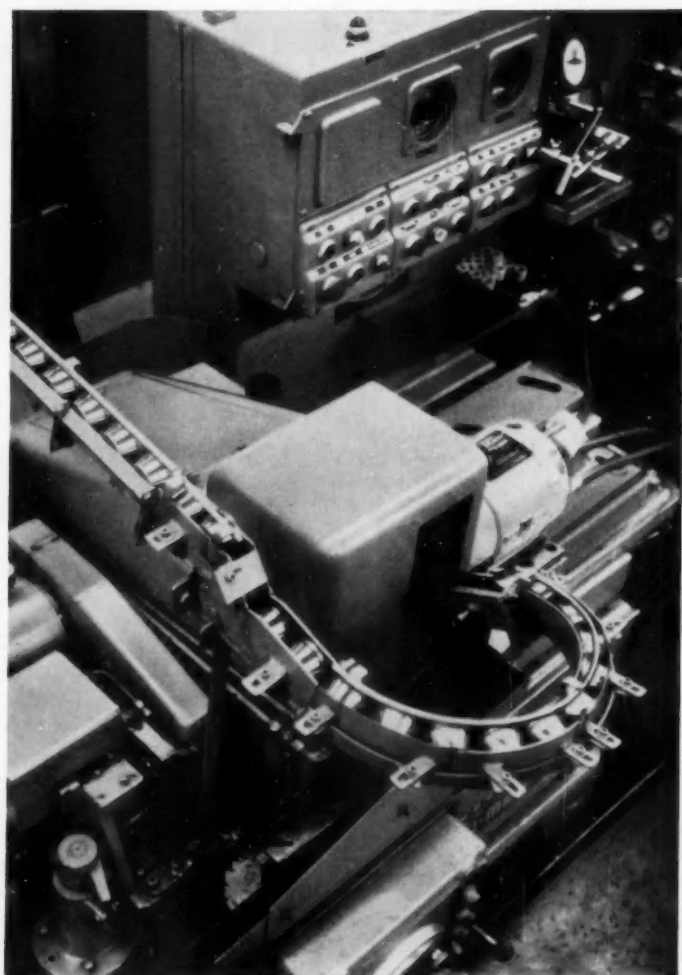
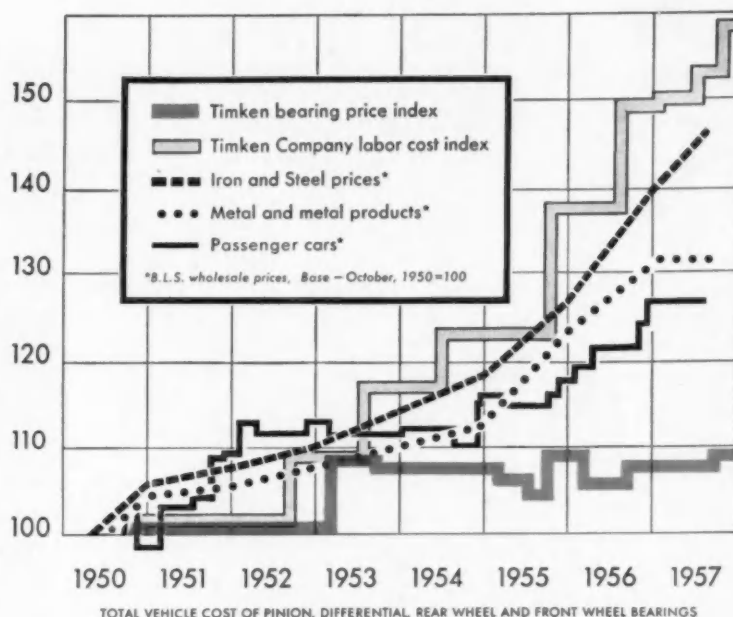
THE ORIGINAL EQUIPMENT PISTONS

# ZOLLNER

ZOLLNER CORPORATION • Fort Wayne, Indiana

## What's way up? Everything but Timken® bearings

Chart the cost of most anything over recent years and it looks like a flight of stairs (see right). But the cost of Timken® tapered roller bearings for the automotive industry has held the line. The auto industry has helped us beat inflation by standardizing on the new Timken bearing sizes produced by revolutionary new techniques that have all industry buzzing.



## Here's how to keep 'em way down

Here's the inside of our unique Bucyrus, Ohio, plant where custom-made machines turn out 30 million new design Timken bearings a year without a hand touching them. This plant can keep your bearing costs down if you: 1) standardize on even fewer Timken bearing sizes—lowering our production costs, increasing your savings; and 2) buy more Timken bearings—the bearings made by low-cost missile age techniques. The more you put standardization to work, the better we can keep your bearing costs down. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

BEAT INFLATION WITH ...  
STANDARDIZATION



# TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

**TAPERED ROLLER BEARINGS**